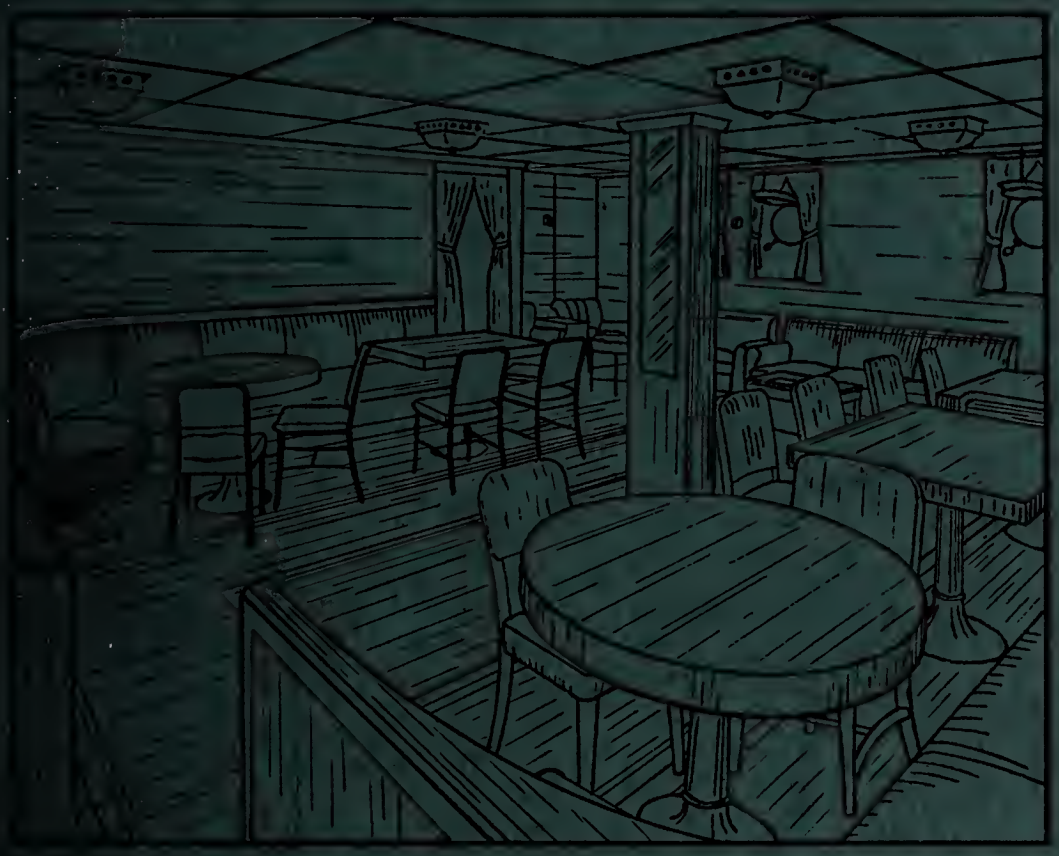
SHIP JOINERY



BULLETIN 345-S

Commonwealth of Pennsylvania
DEPARTMENT OF PUBLIC INSTRUCTION
Harrisburg
October 1942

Vocational Training
for
War Production Workers

Type T2-SE-A1 All-Weld Tanker

SHIP JOINERY

(A Manual of Instruction for Training Beginners and
for Re-training Woodworking Ship Joiners
for Metal Joiner Work)

Bulletin 345-S

Prepared by the

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF PUBLIC INSTRUCTION
DIVISION OF INDUSTRIAL EDUCATION

In Cooperation With

SUN SHIPBUILDING AND DRY DOCK COMPANY
CHESTER, PENNSYLVANIA

In Collaboration With

Representatives of Hopeman Brothers, Inc.
Contractors for Ship Joiner Work

SCHOOL DISTRICT, CITY OF CHESTER
CHESTER, PENNSYLVANIA

and

UNITED STATES OFFICE OF EDUCATION
FEDERAL SECURITY AGENCY

Commonwealth of Pennsylvania
DEPARTMENT OF PUBLIC INSTRUCTION
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1942

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Foreword

The sharp differences between the work of a joiner and that of other shipbuilding occupations of similar title indicated the advisability of preparing separate instructional materials for use in training ship joiners. In many shipyards the joiner is a worker in light metals, in addition to completing specialized woodworking jobs.

The procedures presented in this manual are specifically those which are employed in the yard of the Sun Shipbuilding and Dry Dock Company. Although procedures outlined in the manual may not be applicable in training for some types of shipyards, much of the information presented and many of the procedures outlined will be found useful in training ship joiners for most shipyards where this type of metal joinery is practiced.

The units have been organized and developed in cooperation with men of long experience in metal joinery practice. Detail drawings and standard specifications, which represent current practices, form the background for instruction.

Acknowledgment is made to the Sun Shipbuilding and Dry Dock Company, Chester, Pennsylvania, for assistance and cooperation in making the preliminary analysis and in preparing instructional materials.

Special acknowledgement is extended to James L. McCann, Superintendent of Ship Joinery for Hopeman Brothers, Inc., New York, contractors for joiner work in the Sun Ship Yard, and to Walter R. Omlor, Job Instructor in Ship Joinery, for materially assisting in the preparation of text matter, sketches, and photographs, and also for serving in the capacity of technical advisers.

Appreciation is extended to the Chester School District, and to D. Francis Hallowell, Coordinator of Chester Area Vocational Training for War Production Workers Program, for assistance in this work.

This bulletin was prepared at the Chester Field Curriculum Laboratory of the Pennsylvania Department of Public Instruction. Charles Johnston and George Shaffer, Advisers, Division of Industrial Education, assisted with the preparation of instructional materials.

This unit was completed under the direction of Charles F. Zinn, Adviser, Division of Industrial Education, and under the general supervision of Paul L. Cressman, State Director of Vocational Training for War Production Workers, and Urwin Rowntree, Chief, Division of Industrial Education.

FRANCIS B. HAAS
Superintendent of Public Instruction

December, 1942

INTRODUCTION

A Brief Description of the Ship Joiner's Work

The work of the ship joiner who is employed to install joiner work of a fire-proof nature involves a knowledge of metal trim, ship hardware accessories, and methods of installing special metal fittings. The ship joiner must be able to read necessary blueprints, use certain woodworking and metal working tools, and to work in cooperation with other tradesmen.

The preliminary work of the ship joiner is the laying out of the locations of the various rooms as shown on the blueprint. Measurements are taken from ship center lines. When the locations of the various rooms have been laid out, the necessary work done by other craftsmen may begin. The pipefitter, electrician, ship carpenter, sheet metal mechanic, and radio man all have work to do as soon as the ship joiner's work is ready for their services.

After the quarters are tested and the iron painted, the ship joiner installs the vertical and horizontal furring or ground work. The services of the welder and the burner are required for this installation, but the joiner supervises the burning and welding to insure that the work will be fair and straight. One of the first operations is to install the stairs which provide easy access from one deck to another. This is done to make working conditions less hazardous by eliminating the necessity for ladders or scaffolding. Insulation of an approved type is installed correctly and secured in place.

Intermediate bulkheads are erected. The locations of the bulkheads establish the boundary lines for rooms, bathrooms, and passages as well as the center lines for lighting fixtures and ventilators. When other craftsmen have finished their work, the joiner erects shell lining and ceilings and constructs the wardrobes. The erection of bulkheads and the installation of doors require the use of self-tapping screws and a knowledge of the proper sizes of drills to use when driving certain screws in metal.

Port light frames are set; and bathrooms, rooms, and wardrobes are trimmed with the correct metal trim properly placed according to the blueprint.

All of this work is somewhat different from what it was when done entirely in wood.

After the floors are in place, wood or metal furniture, ajar hooks, bumpers, locks, coat hooks, coat rods, clock pads, notice frames, and many other metal accessories are installed. Boxes and lockers of various types are fastened to the steel deck.

The insulation and finishing of the cargo holds and the construction and insulation of the ship refrigerators also are jobs which are done by the ship joiner.

From this brief description of the work involved, it is evident that the joiner must be able to adapt himself to working in either wood or metal. Although he encounters many problems, he must give his work a clean, neat appearance, since this is one of the chief objectives in joiner work.

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Part I

GENERAL SAFETY PRACTICES

The Introduction of the Safety Movement

The introduction of safety into industry has been a natural development. Production was speeded up when the use of machinery and machine tools superseded the handicraft of skilled mechanics. Workmen had to be trained to work safely with the new equipment at the same time new skills were being taught. Industrial accidents were frequent when machines were first introduced. The application of safety measures not only reduced the number of accidents, but actually increased efficiency.

Industry has tried for years to reduce lost-time accidents. It has accomplished much over a period of years; much remains to be accomplished. Safety education, therefore, is a factor of prime importance in any industry. By removing the cause of accidents, largely carelessness, a still greater reduction in the number of lost-time accidents is possible.

Safety education is a vital part of an effective accident prevention program. If new workers are to be wide-awake to the many hazards around the shops and yards, their attention must be directed to these dangers. Lectures to workers, posters showing the effects of carelessness, reading material, and safety contests are only a few of the methods used to make workers safety-conscious.

A safety department is located within each shipyard. The duty of the safety engineer is to note common hazards, to be on the alert for new dangers, and to study accident reports so that the recurrence of accidents may be prevented. It is the duty of every worker to cooperate with the safety engineer by practicing safety measures and by reporting to the proper safety officials particular hazards that the worker has observed.

Before beginning work, new employees usually receive safety instruction under the direction of the safety engineer. The safety engineer stresses the general safety rules of the yard at this preliminary meeting.

Today, when industry is pressed for greater production and when the influx of new workers is great, the matter of safety becomes more and more important. The most practical means of keeping accidents at a minimum is to develop a safety consciousness in employees and to train them in safe work practices. A trainee cannot be considered properly trained until he can do two things: first, perform skillfully and accurately the work required of him; and secondly, do that work in a manner which is safe for himself and others. Workers must be thoroughly impressed with the idea that only a safe worker is a good worker.

Accidents mean a loss both to the worker and to the employer. The dangerous worker is not only a hazard to himself, but also to the workmen about him. The best safeguard against accidents is a safe workman; therefore, safety practices should be taught to the worker, insisted upon by the yard, and observed at all times by the employees.

Safe and Orderly Working Surroundings

The two principal causes of accidents are, unsafe procedures on the part of the workman and unsafe working environment. Keeping working surroundings physically and mechanically free from danger is important. Typical hazardous practices are as follows:

1. Working in dark rooms with insufficient light.
2. Working where tools are scattered carelessly on the floor.
3. Working where excess scrap materials litter the floor.
4. Working around makeshift electrical wiring.

Working under disorderly conditions often makes a workman careless. Each worker should take the responsibility of keeping his working space free from hazards. Where unsafe conditions can not be remedied, the workman must be extremely cautious.

Proper Lighting

Adequate light should be provided at all times; however, special care should be taken to prevent glare. Aisles, stairways, and dark rooms need to be well lighted.

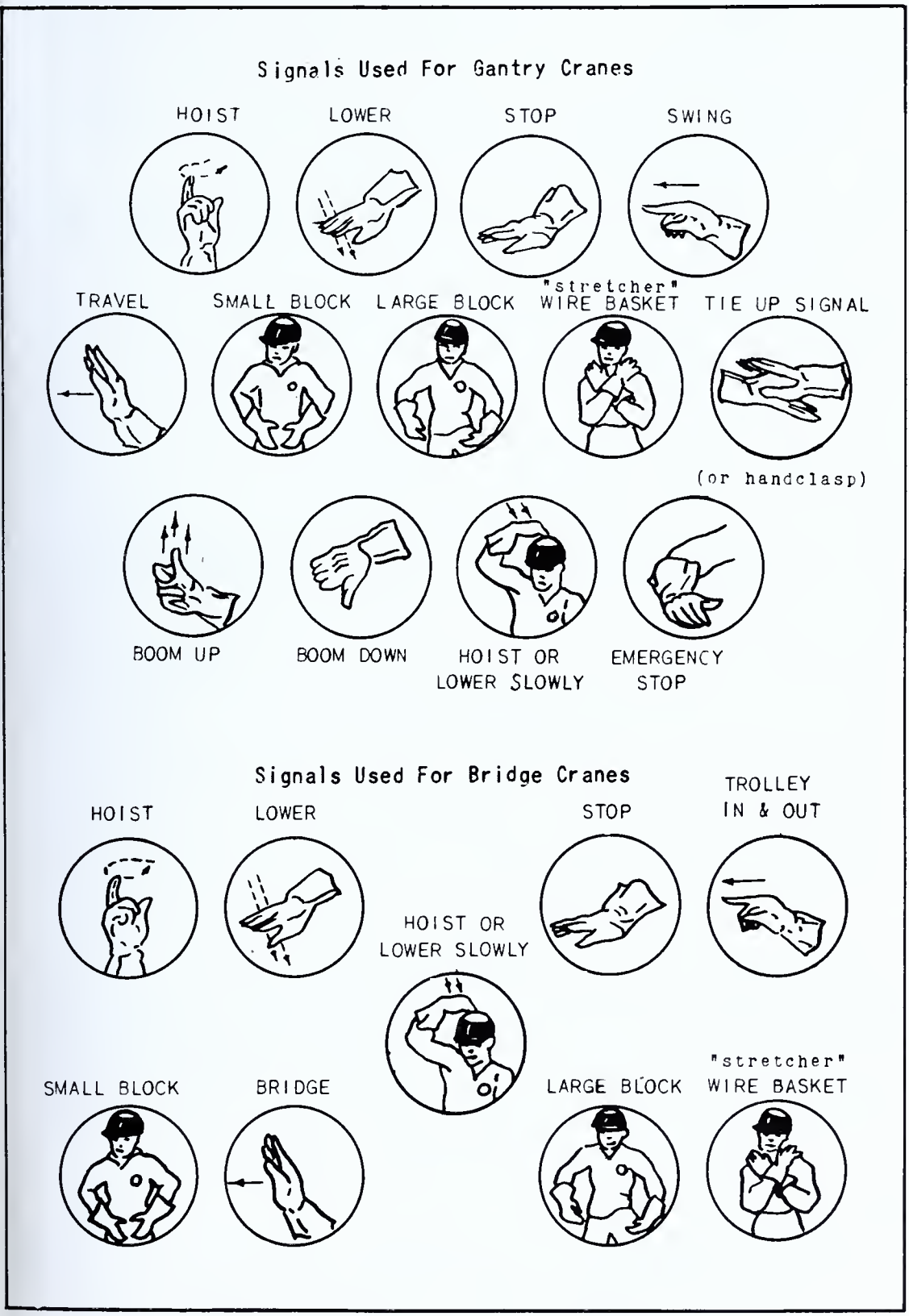


FIG. 1 — *Conventional Signals Used in the Shipyard*

Improper lighting has been responsible for many accidents. It is extremely difficult to work in poor light. Working under poor lighting conditions causes fatigue, which increases accidents.

This caution is particularly applicable to the ship joiner, who often is required to work where artificial light is necessary.

A temporary-light man is available at all times to install temporary lighting where needed.

Hazards Which the Ship Joiner Must Consider

1. Hazardous climbing.
2. Leaking gas hoses.
3. Improper shoring.
4. Danger from overhead or falling objects.
5. Danger from explosive gas (during repair work in or near tanks and pipe lines).
6. Taking risks.
7. Daydreaming.
8. Tampering with electric switches or fuse boxes.

Crane Signals

The only person who should signal to a crane operator is the man who has been authorized to do so. See Fig. 1.

Loose Clothing Hazard

At times ship joiners and allied workers climb and work at considerable heights. Shirts, especially the sleeves, should not be loose enough to catch on staging and throw the workman off his balance. Long or turned-up cuffs of overalls are particularly dangerous; cuffs should be removed entirely or sewed into position to prevent the possibility of dragging.

Piling Materials Properly

Pile materials securely and in such a position as not likely to be jolted over or knocked over (Fig. 2). Keep piles of materials within safe heights, and pile in such a manner as to make them accessible without disturbing the entire

pile. This calls for suitable storage space for all materials. Furthermore, each person using such materials must make himself responsible for keeping them in the proper place.

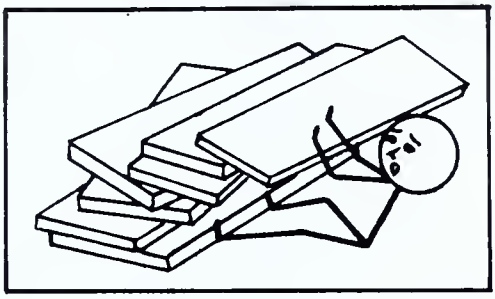


FIG. 2
Carelessly Piled Boards

SPECIAL SAFETY PRECAUTIONS

1. Lift heavy objects carefully.
2. Be cautious when working on floors where grease or oil has been spilled. A few drops of oil can cause a serious fall.
3. Never work alone in an enclosed room.
4. Report to the dispensary, no matter how slight the injury.
5. Report hazardous conditions to your leader.
6. Cover all open holes.
7. Do not wear loose-fitting clothing.

TWELVE RULES TO BE OBSERVED BY SHIP JOINERS

1. Learn the fundamentals of blueprint reading.
2. Study the drawing carefully before beginning the job.
3. Take all measurements accurately.
4. Keep all cutting tools sharp.
5. Keep all tools well oiled and in good order. (The condition of the mechanic's tools reflects his working habits).
6. Have a place for everything and keep everything in its place.
7. Assume responsibility for the accuracy of the job.
8. Observe and study superior workmen.
9. Read and study technical magazines related to the work.
10. When a job is spoiled, tell the foreman immediately; do not offer any excuses.
11. Work safely at all times; a careless workman is a hazard to others.
12. When in doubt, consult the leader or foreman.

QUESTIONS

1. What has been the result of the safety education movement?
2. What does "safety-conscious" mean?
3. What are the duties of the safety engineer?
4. What two things should a trainee be capable of doing before being considered properly trained?
5. Why is poor lighting a hazard to workmen?
6. Name some common hazards.

Part II

JOINERS' TOOLS AND THEIR USES

List of Personal Tools Needed By the Ship Joiner

1. 6′ rule
2. 50′ steel tape
3. Combination square
4. Steel square
5. Ship bevel
6. Sliding T-bevel
7. 26″ 10-point crosscut saw
8. 26″ 8-point ripsaw
9. Compass saw
10. 12″ hack saw frame
11. Jack plane
12. Block plane
13. Spokeshave
14. 1 set wood chisels, ¼″ – 1½″
15. 3½″ roughing chisel
16. ⅝″ cold chisel
17. 16-ounce claw hammer
18. Center punch
19. 16-ounce ball peen hammer
20. 1 set of nail sets
21. 10″ ratchet brace
22. 1 set of auger bits, ⅛″ – 1″
23. 1 expansive bit, 1″ – 2″
24. 3 rose countersinks
25. Automatic screwdriver (medium)
26. 3 sizes of screwdriver bits
27. Twist drills (to suit need, or job)
28. Wood drills (to suit need, or job)
29. Automatic hand drill
30. Adjustable wrench
31. 1 pair of 12″ dividers
32. 1 pair of side-cutting pliers
33. 1 pair of gas pliers
34. 1 pair of tin snips
35. 24″ level
36. Plumb bob
37. Chalk line
38. Butt gauge
39. Carborundum stone
40. Several 3″ C-clamps
41. Wood rasp
42. Metal-cutting files (to suit jobs)

Rules, Scales, Tapes

Folding Rule

Six-foot folding rules, either metal or wood, are often used to advantage. With care, very close measurements may be taken. The 12 sections of the rule fold up into a small bundle about 7½ inches long, 2½ to 3 inches wide, and possibly ¾ inches thick, depending on the width of the rule. See Fig. 3.

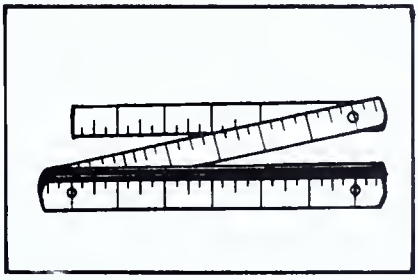


Fig. 3

Special Features

The folding rule is very useful for several reasons: It may be adjusted at the joints to form an angle; it may be pushed up as high as a man can reach, straight overhead without buckling, (as is often the case with a steel tape); or it may be supported at two points along the length while the mechanic steps back to take a sight on some part of the work when he is working alone.

Accuracy of the Folding Rule

A folding rule is not as accurate as a steel tape; when the rule becomes worn at the joints, an error of as much as 3/16 of an inch in six feet is possible. It is always better to use a steel tape when accurate measurements are to be taken. Six-foot rules are graduated to 1/16 of an inch. This fact makes it clear that this type of rule was not designed for very close measuring.

Standard Measure

In order for the joiner to have his work agree with the blueprint, he must follow the sizes given and measure from the center lines or other points exactly as indicated. He must use the same type of measuring tool which was used by the draftsman. It follows, then, that all scales are STANDARD; that is, the length of one inch or one foot on one scale is the same length as one inch or one foot on another scale.

Scale Divisions

When we examine a rule, we find there are many marks or fine cuts along the edge of the tool. These marks are for the purpose of dividing the length of the scale into many equal parts. No matter how long the scale may be, each inch is found to be exactly the same length. If all the work to be measured were an exact number of whole inches in size, a scale divided into inches would serve the purpose. But this is not so.

Reading Measurements

Measurements are given in feet and inches, or in feet, inches, and parts of an inch. For example: A certain panel is $\frac{3}{4}$ of an inch thick; 1 foot, 2 inches wide; and 2 feet, $4\frac{1}{2}$ inches in length. Another way of saying the same thing would be: $\frac{3}{4}''$ x 1′ 2″ x 2′ $4\frac{1}{2}''$. The x used here means "by". For example:

2″ x 4″ is read "two by four inches". Sizes are sometimes given in feet and inches; often they are given in inches or parts of one inch.

Reading Measurements Correctly

A ship joiner must be able to read a rule quickly or he is not a good mechanic. He will lose a lot of time and cause others to lose time unless he can read a rule correctly at the first attempt. The mechanic must thoroughly understand the markings on the rule before he can read it correctly.

One-Inch Graduations

On a one-foot scale there are 12 inches in one foot; so a one foot scale has 12 equal spaces but only 11 marks or dividing lines. The lines mark off the spaces. The spaces are called graduations. With the scale indicated in Fig. 4 one can measure as close as one inch.

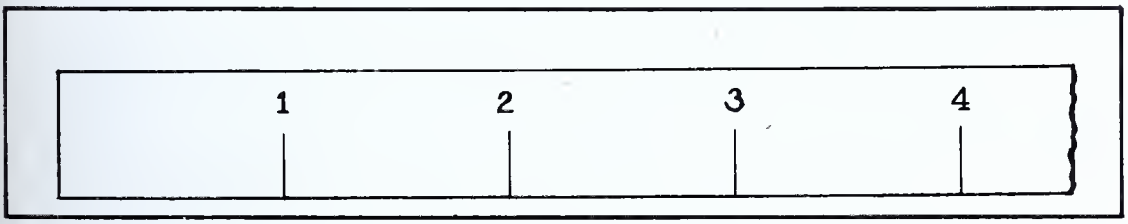


Fig. 4 — *One-Inch Graduations*

The markings on the scale show one standard graduation or division which in this case is 1 inch. Of course this scale would be all right to measure even inches, but anything less than one inch could not be measured. Marking off each division or graduation into half-inches overcomes this objection. See Fig. 5.

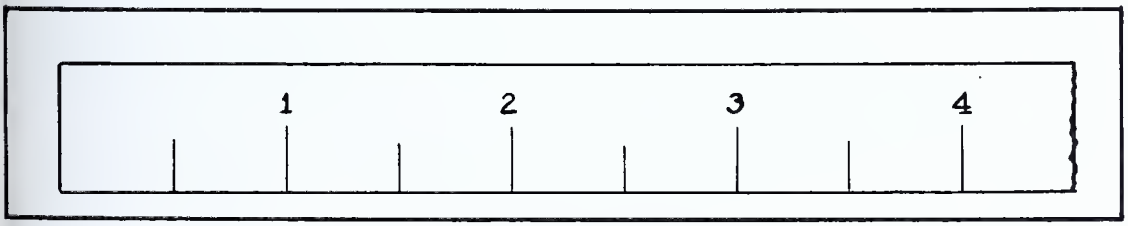


Fig. 5 — *Half-Inch Graduations*

Half-Inch Graduations

Now the markings on the scale show two graduations or divisions of the same length in one inch. This scale can be used to measure as close as $\frac{1}{2}$ inch.

But the work has to be measured much closer than ½ inch; therefore, the graduations or divisions must be made still finer.

Quarter-Inch Graduations

The markings on the scale (Fig. 6) show four graduations or divisions of the same length in one inch. This scale could be used to measure as close as ¼ inch.

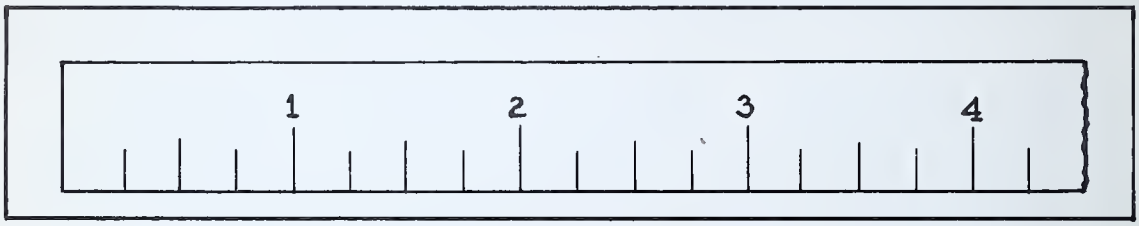


Fig. 6 — *Quarter-Inch Graduations*

Eighth-Inch Graduations

The markings on the scale (Fig. 7) show eight graduations or divisions of the same length in one inch. This scale could be used to measure as close as ⅛ inch.

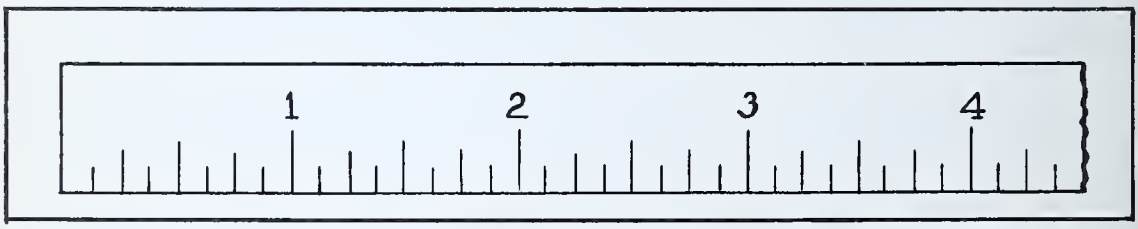


Fig. 7 — *Eighth-Inch Graduations*

Sixteenth-Inch Graduations

The markings on the scale shown in Fig. 8 indicate sixteen graduations or divisions of the same length in one inch. This scale can be used to measure as close as 1/16 inch.

This is as close a reading as is found on a 6′ rule.

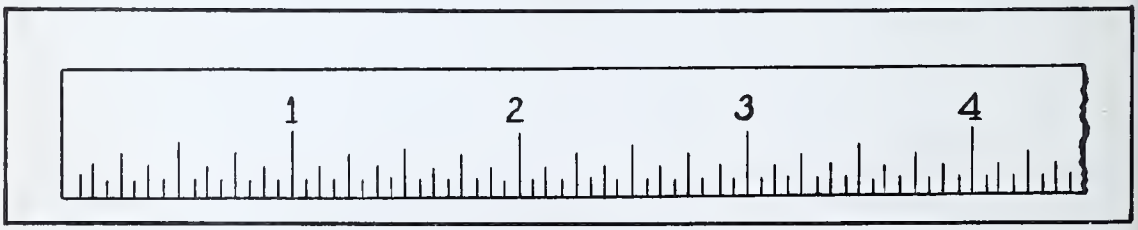


Fig. 8 — *Sixteenth-Inch Graduations*

Types of Steel Tapes

There are several types or kinds of mechanics' scales. One scale widely used is a six-foot tape, made of steel ribbon. The steel ribbon varies from $\frac{1}{4}''$ to $\frac{3}{4}''$ in width; it is graduated as fine as $1/16''$. The thin ribbon rolls up into a casing, some casings having an inside spring which helps wind up the tape. See Fig. 9.

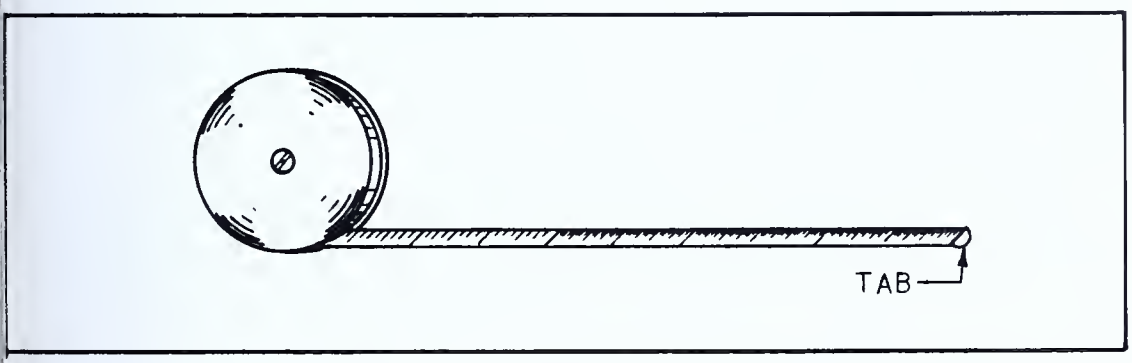


Fig. 9 — *Six-Foot Steel Tape*

Using the Tab

A small tab is shown on the end of the tape in Fig. 9. This tab can be hooked over the end or edge of a piece of material while the mechanic stretches the tape tightly. The reading is then taken. The mechanic must never let the tape "sag", or get slack, while he is measuring work. He should always take the measurement from the inside of the tab.

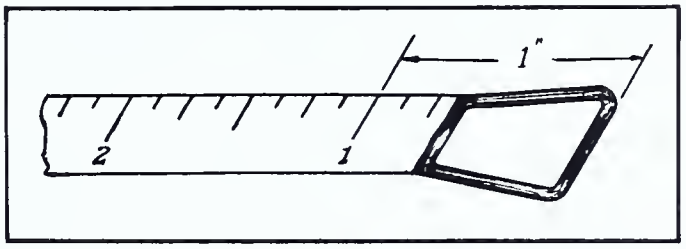


Fig. 10 — *Loop end of Fifty-Foot Steel Tape*

Fifty-Foot Steel Tape

Another type of steel tape is 50 feet long. Very long measurements are taken with a fifty-foot steel tape. These tapes must be used correctly or faulty measurements will result. On the end of the tape there is a loop of stiff wire. See Fig. 10.

Caution

Notice that it is *one inch* from the *outside end of the loop* to the Figure 1 on the tape. This loop prevents the tape from being lost in the casing when the mechanic winds it up after using. Always measure from the outside end of the loop. Do not allow the loop to become folded over or under.

All steel tapes used where accuracy is required must be checked each week with the tape belonging to an official of the company and kept by him for this purpose. Some mechanics check their tapes twice a week on regular days, Monday and Thursday, before starting work on those days. To make the check, reel out the official's tape far enough to check the total footage to be used on a specific job. Run out the tape to be checked, place the zeros of the two tapes even, and check the highest foot mark required by the job with that foot mark on the official's tape. If they correspond exactly, the checked tape may be put into use. If there is any discrepancy at the highest foot mark, do not use this tape for accurate work.

In using a steel tape, always keep it straight. Never hold it or lay it down in such away that it will kink. A kinked tape is inaccurate and will soon break.

In placing the one-foot mark on a point, the mechanic must put the *center* of the scale mark exactly on the point.

Never walk on a tape, and never drop anything on it; it is a fragile, sensitive tool.

When measurements are to be taken that will necessitate unreeling the full length of the tape, unreel the full length and carefully lay the tape alongside the line on the floor where measurements are to be made. Stand the reel or case up on the floor to keep all of the tape right up to the case perfectly flat.

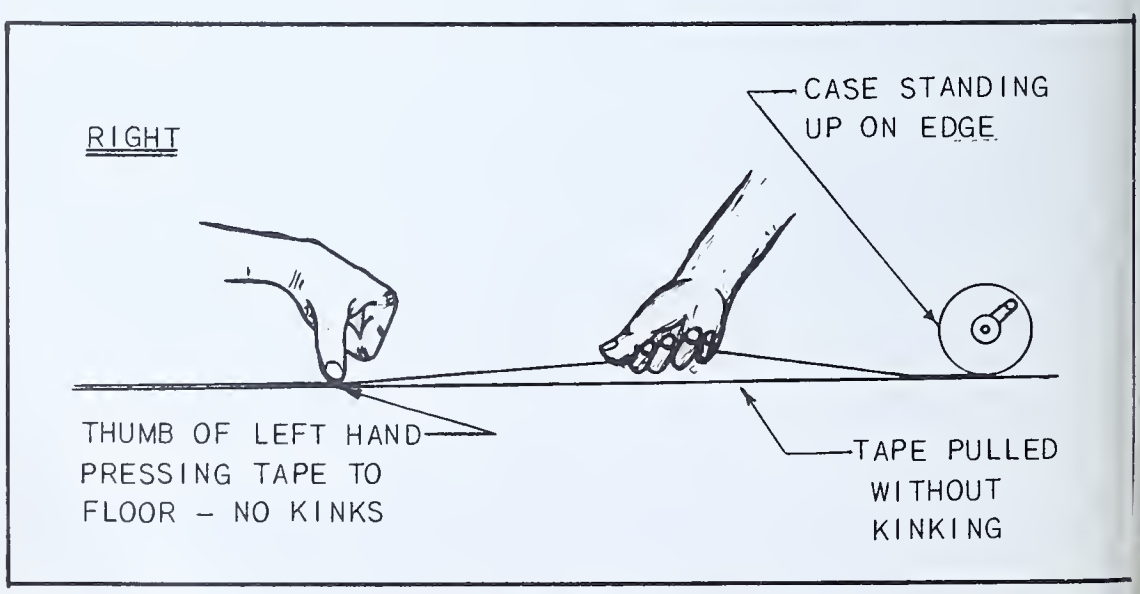


Fig. 11 — *Correct use of a Steel Tape*

If a tape is to be left stretched out on the floor any length of time, lay template boards up close to the tape for the full length of the stretched-out portion. The edge of the template board will prevent anyone's actually stepping on the tape. A shoe will clear the tape because the thickness of the edge of the template board will force the shoe to "bridge" over the tape lying alongside.

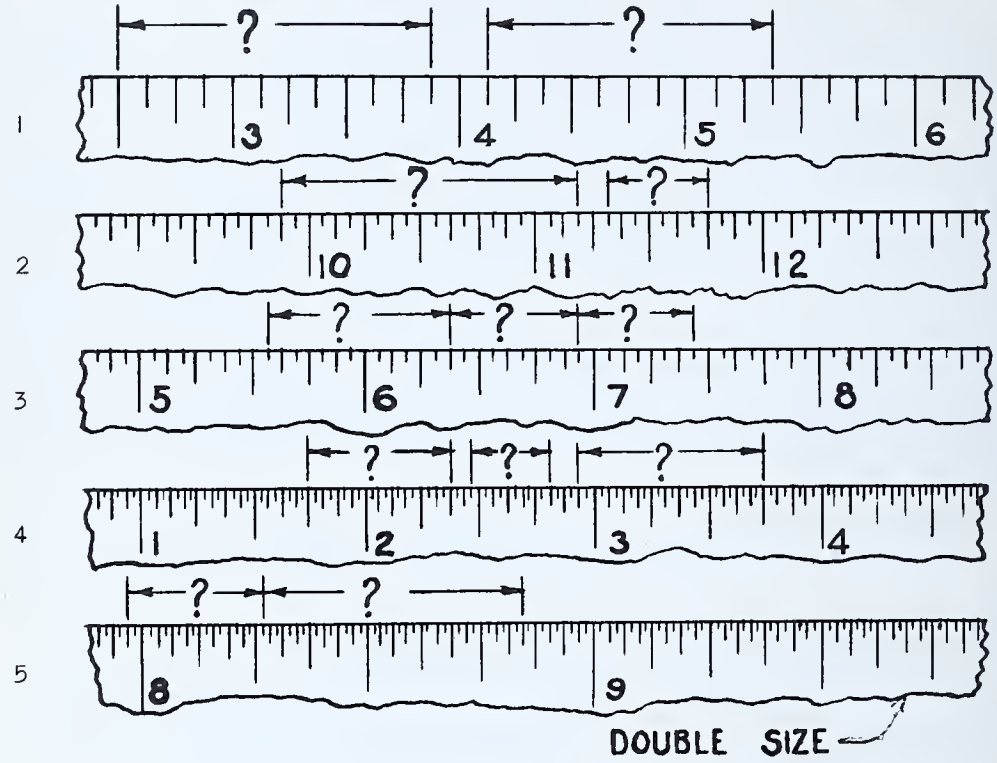
To pull a steel tape to get slack out of it, place the thumb on top of it and the fingers of the same hand under the tape and pull. Do NOT PRESS THE THUMB TO THE FLOOR. To do so will make a sharp bend in the steel back of the tape and may permanently damage the tape by kinking it. Pull the tape at a point 12 inches beyond the mark, press the tape to the floor *at* the mark (which will be 12 inches from the thumb and fingers pulling the tape), and take the reading. "Kinking" is avoided when measurements are taken in this manner. See Fig. 10.

QUESTIONS

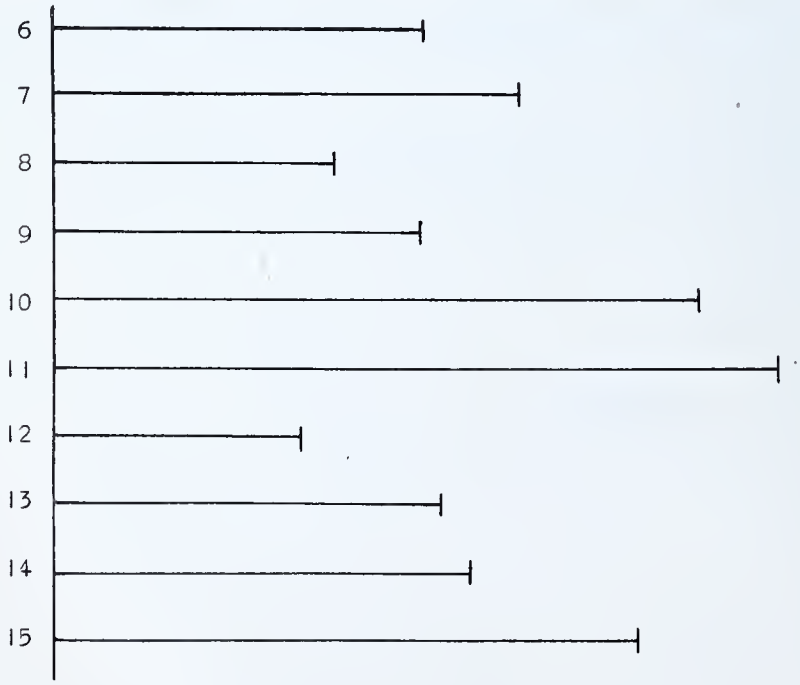
1. **When measuring with a six-foot steel tape, does a mechanic take the measurement from the outside or inside of the tab?**
2. **When measuring with a 50′ tape, does the mechanic take the measurement from the outside or inside of the wire loop?**
3. **What are the finest graduations on a six-foot rule?**
4. **Explain the advantages and disadvantages of a folding rule.**
5. **What precautions are taken when measuring with a fifty-foot steel tape?**
6. **Is it better to measure from the end of a scale or from a graduation mark when taking a close measurement?**

Measuring Lengths

The dimensions between the arrows are to be read. Use a separate sheet and record the measurement. DO NOT USE A SCALE TO MEASURE.

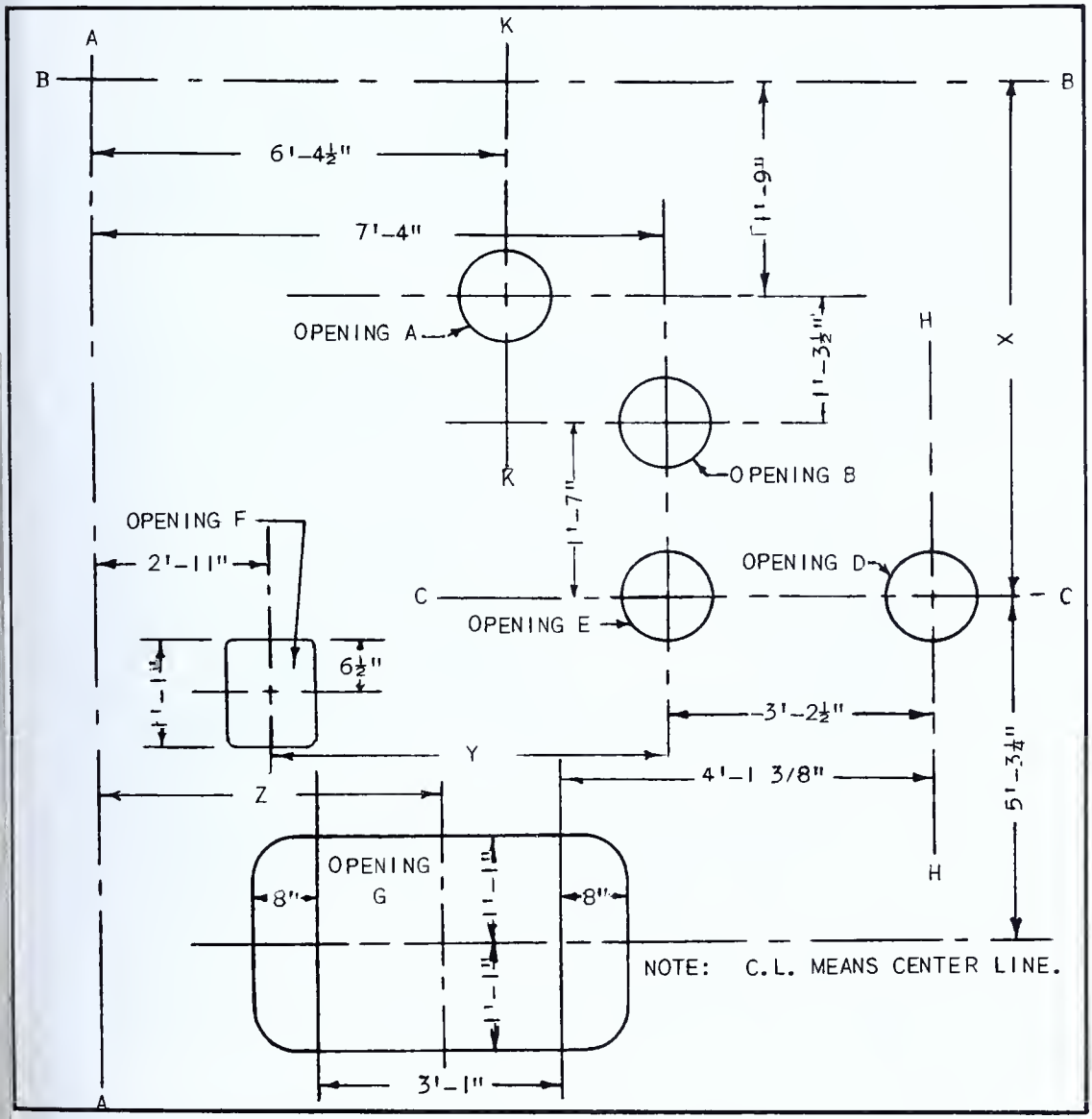


Measure with a rule the lengths of these lines from the long line to the short line. Place the correct figure on a separate sheet.



Reading Dimensions

ALL CENTER LINES ARE IN THE CENTERS OF OPENINGS



1. What is distance X?
2. How long is opening G?
3. What is the total width of opening G?
4. What is distance Y?
5. Give the distance from C. L. "A–A" to C. L. "H–H".
6. What is the vertical distance from center of opening A to center of opening D?
7. State the horizontal distance from C. L. "K–K" to C. L. "H–H".
8. What is the distance from C. L. "B–B" to C. L. "C–C"?
9. How much does distance "Z" measure?
10. Measure distance from C. L. "C–C" to center of opening A.

Miscellaneous Tools

Combination Square

Figure 12 shows a combination square which consists of three parts. The square head (Fig. 13) may be used with the blade so that a line can be scribed at right angles with an edge or surface, or a true 45-degree line can be laid off, depending on the

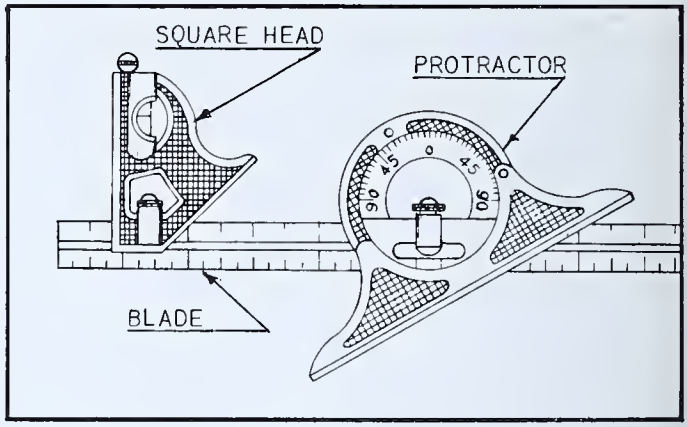


Fig. 12 — *Three-Piece Combination Square*

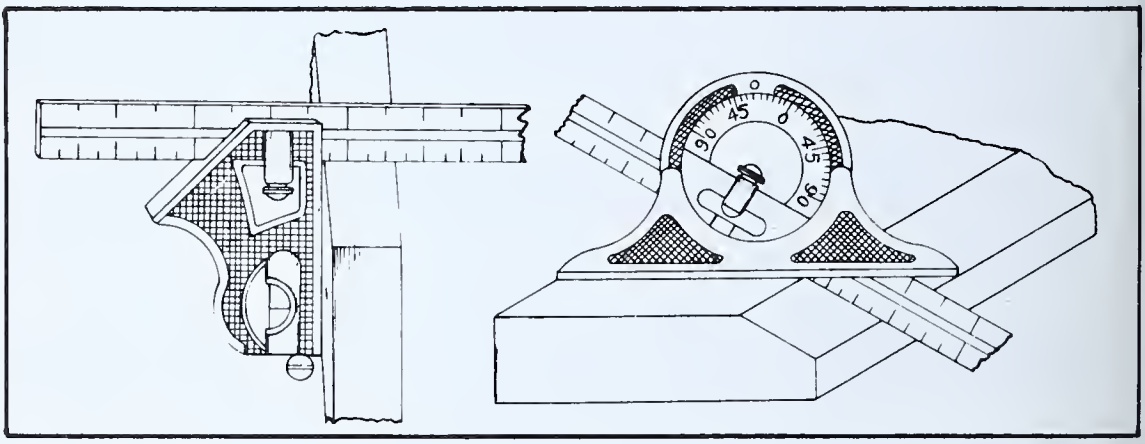


Fig. 13 — *Square Head and Blade*

Fig. 14 — *Protractor Head and Blade*

side of the head used. When the blade is used with the protractor head (Fig. 14), lines may be laid off from a straight edge or surface at any angle up to 180 degrees.

The blade is a scale which may be used for measuring the same as any other scale. The size of the combination square depends on the length of the blade. The heads of the tool are made in proportion to the length of the blade. Combination sets usually have a 12″ or an 18″ blade. Do not drop the tool, for this will destroy its accuracy.

Steel Square

The steel square (Fig. 15) measures 16″ x 24″, or 18″ x 24″ and is the same thickness throughout, usually $\frac{1}{8}$″. The 24″ part is called the "blade" or "body" and is 2″ wide. The 16″ or 18″ part is called the "tongue" and is

1½″ wide. The "face" of the square is the side on which the manufacturer's name is stamped. The steel square is very useful in testing the squareness of panels, setting furniture, laying out and setting stairs, etc. The uses of the steel square are so numerous and varied that whole books have been written on this subject.

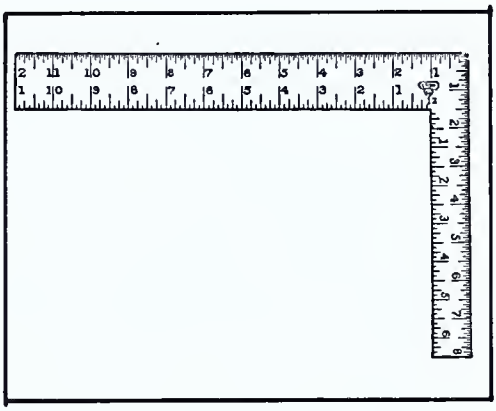


FIG. 15 — *Steel Square*

SHIP BEVEL

A ship bevel (see Fig. 16) is similar to a T-bevel, but differs in that it is made of wood and has a wing nut for easy adjustments. A popular size is 30″ long.

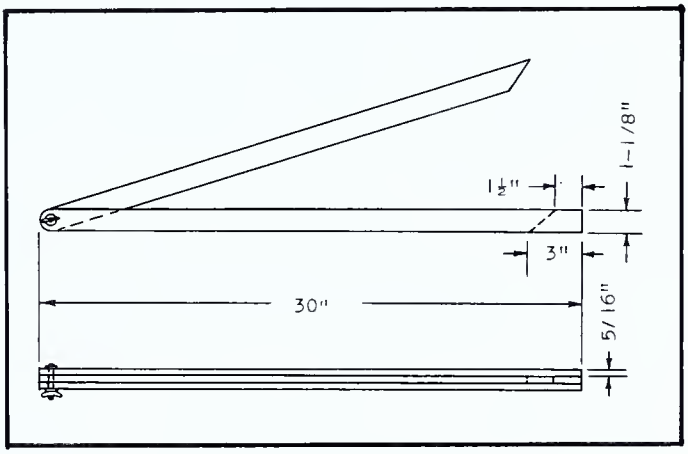


FIG. 16 — *Ship Bevel*

SLIDING T-BEVEL

T-Bevels (Fig. 17) are similar to the try square but differ in that their blades are adjustable to any angle. They are used for laying out angles other than right angles and are very useful when trimming out rooms and passageways.

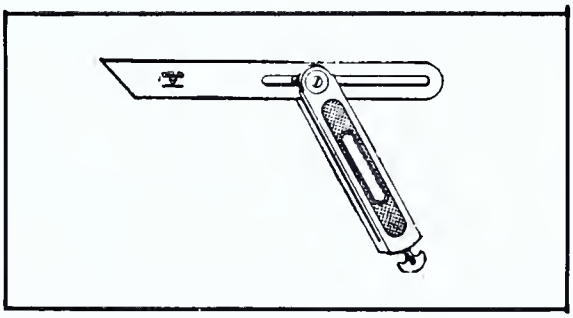


FIG. 17 — *T-Bevel*

HAND SAWS

The saw was one of the earliest tools employed by man, dating back to the stone age when it was made by chipping notches in the edge of a piece of flint. The primitive flint saw would make a marked contrast beside the up-to-date saw fashioned of silver steel. See Fig. 18.

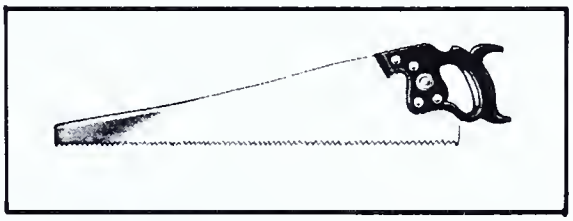


FIG. 18 — *Crosscut Saw*

CROSSCUT SAW

Crosscut saw teeth are filed so that

they come to sharp points at the outside edge of the blade and at the ends of the teeth. The difference between a coarse-toothed saw and a fine-toothed saw is the number of points per inch. Crosscut saws range from 20″ to 26″ in length and for general work have from 8 to 10 points per inch. See Fig. 19.

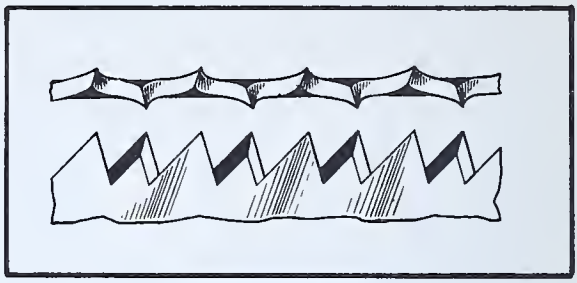


Fig. 19 — *Two Views of Crosscut Saw Teeth*

There is always one more point than teeth per inch. See Fig. 20. The teeth of a crosscut saw form a 60° to 70° angle with the blade of the saw. A crosscut saw is used in cutting across the grain of the wood.

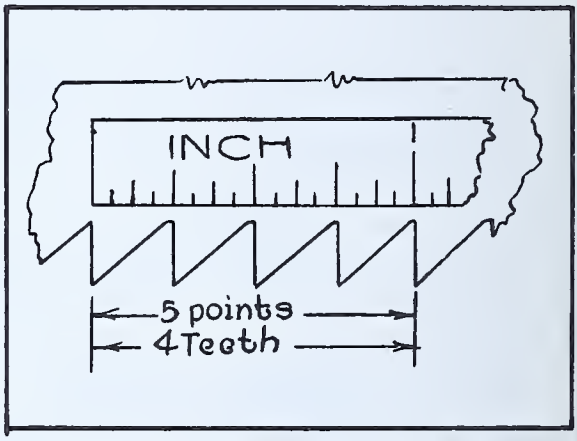


Fig. 20 — *There is One More Point than Teeth per Inch*

Ripsaw

With the exception of the teeth, the ripsaw and the crosscut saw are identical. The teeth of the ripsaw are chisel-edged. See Fig. 21. The front edges of the teeth are perpendicular to the blade. The ripsaw, as its name implies, is used in cutting parallel to the grain of the wood.

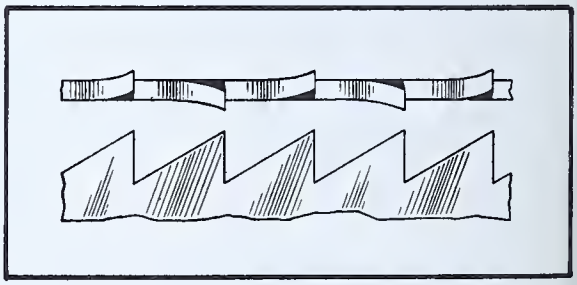


Fig. 21 — *Two Views of Ripsaw Teeth*

Compass Saw

The compass saw is filed like a ripsaw, but its blade is narrow so that it can cut on curved lines. See Fig. 22. It is particularly useful in cutting a section from within a board or panel. A hole is bored near the line to be cut, and the pointed end of the saw is inserted in this hole.

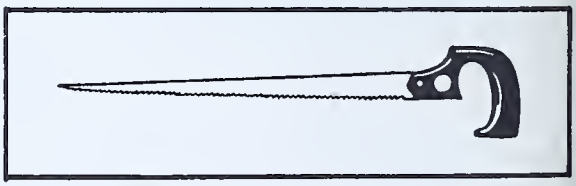


Fig. 22 — *Compass Saw*

Hack Saws

Hack saw frames are made adjustable to take blades 8, 10, 12, or 14 inches long. See Fig. 23. A 12″ hack saw

blade is a convenient length for ordinary use. The teeth are spaced fine or coarse, and are designated according to the number of teeth per inch.

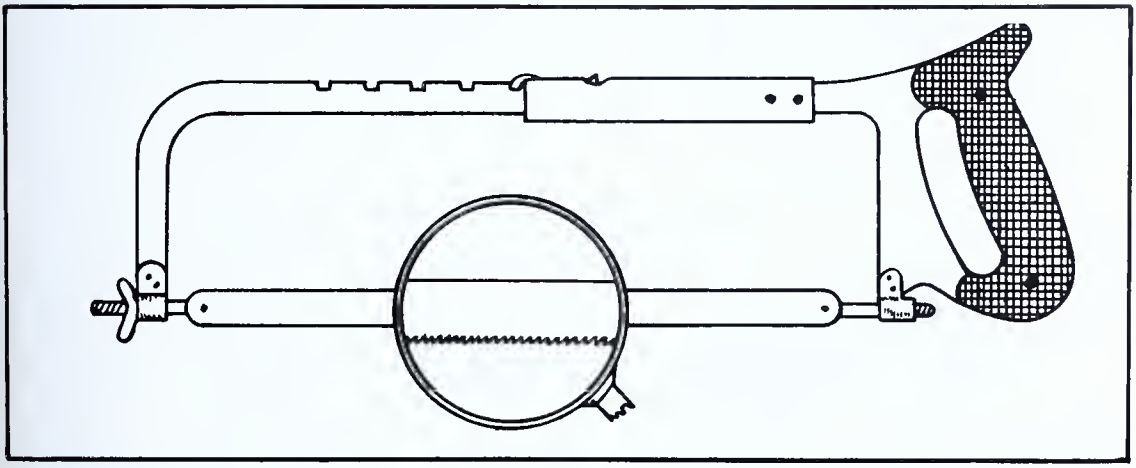


FIG. 23 — *Hack Saw*

HACK SAWING SUGGESTIONS

1. Keep the blade under the correct tension. To avoid breaking the blade, ask the leader to check the tension the first few times.
2. Hold the saw straight across the work, and make even strokes from toe to heel. (The instructor will demonstrate this).
3. *Do not saw fast.* Fourteen strokes to the minute are plenty.
4. *Do not bear down too much.* Such pressure causes the teeth to "strip", and the saw will "bow", very often resulting in breakage.
5. Ease up slightly on the return stroke.
6. When sawing thin stock or tubing, use a fine-toothed saw.
7. Coarse-toothed saws are better for soft stock or wide material. Fine-toothed saws "plug up" in soft material.
8. Do not allow the saw to "bind" in the cut. Follow a vertical line when sawing downward. If the saw is not held "easy" in the cut, it will likely break.

(The above are only a few of the many precautions to observe when using a hack saw).

PLANES

The plane at first was nothing more than a chisel driven at an angle through a block of wood. It later was improved to include a wooden wedge to hold the

plane iron in place. The plane iron was much thicker at the cutting edge than at the opposite end. The reason for this was to strengthen the cutter and also make it easier to wedge. The handle was added and followed by the cap iron, which was a still greater improvement, because it broke the shavings as soon as they were loosened and thus prevented the tendency to split the wood ahead of the cutter.

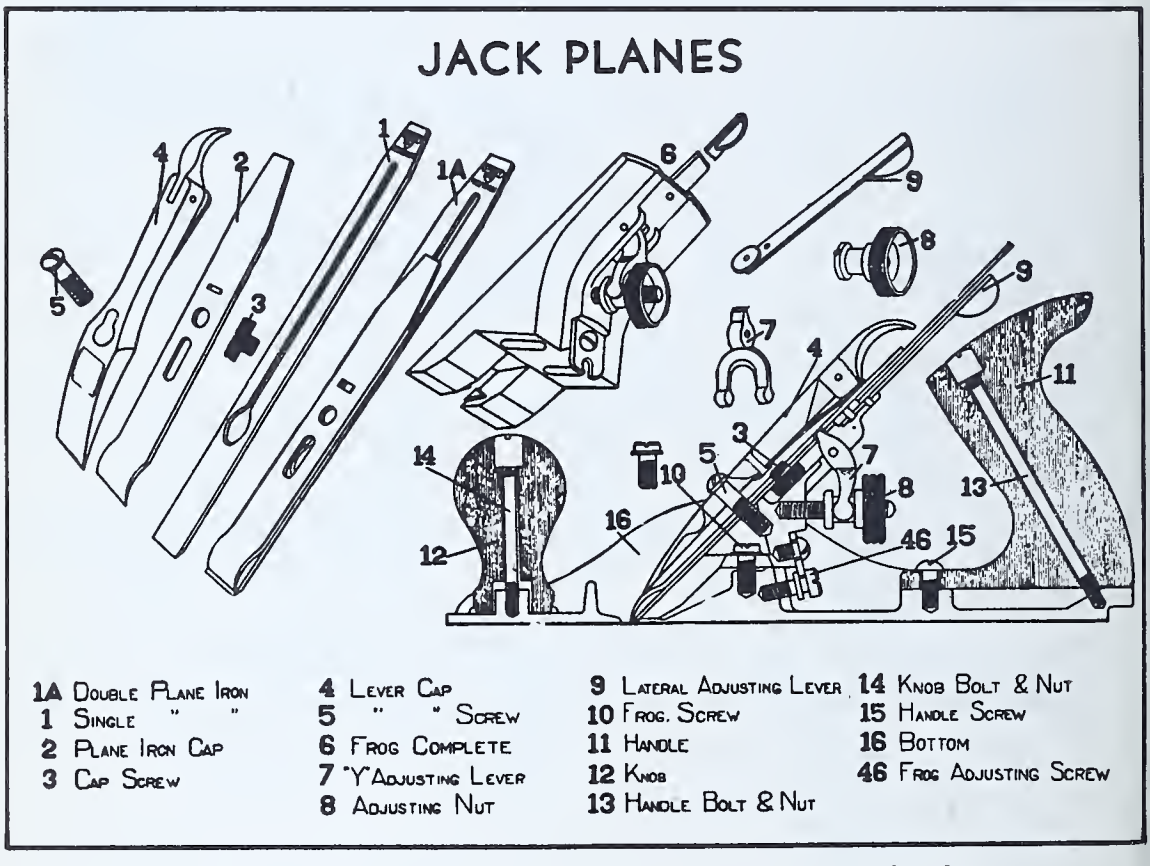


Fig. 24 — *Details of an Iron Plane. (Courtesy of Stanley Rule and Level Co.)*

Jack Plane

The jack plane (Figs. 24 and 25) is so named because of its size. It can be used for a great variety of jobs and is sometimes referred to as "jack of all jobs."

The bed of the jack plane is approximately 14" long and has either a corrugated or smooth side.

The principal parts of an iron plane are shown in Fig. 24.

Block Plane

The block plane is a small plane from 4″ to 8″ long. (Fig. 26.) It has only a single plane iron which is placed at a very low angle with the work. The blade is placed in the plane with the beveled side up.

The lever cap is generally curved so that it fits smoothly into the hollow of the hand. It is used for planing end grain and for working in places where the mechanic cannot use a regular cap equipped plane.

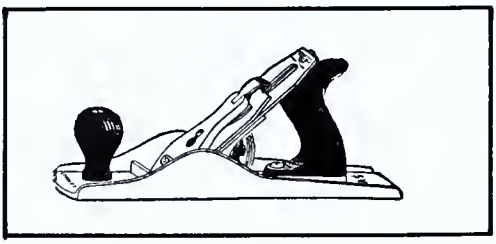


Fig. 25 — *Jack Plane*

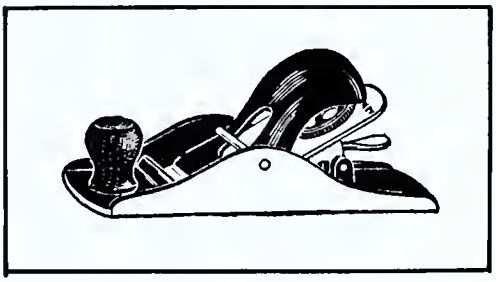


Fig. 26 — *Block Plane*

Spokeshave

The spokeshave (Fig. 27) is a tool designed for use in smoothing curved edges of wood. The cutting principle is the same as that of the plane. It has two handles and resembles a cabinet scraper in appearance.

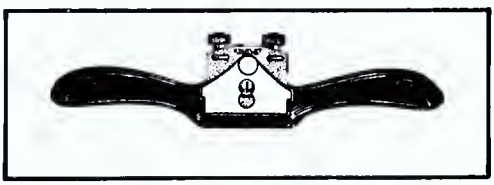


Fig. 27 — *Spokeshave*

Wood Chisel

A wood chisel is used in making joints or in fitting pieces of wood together.

Chisels may be divided according to their construction into two general classes:

Tang chisels — in which part of the chisel enters the handle.

Socket chisels — in which the handle enters into a part of the chisel.

This chisel (Fig. 28) is known as a socket-paring chisel and is used for doing fine work.

Framing Chisel

The framing chisel (Fig. 29) used by the joiner has a very strong blade and handle all forged in one piece. This chisel is indispensable in setting panels.

Cold Chisel

There is a large variety of cold chisels for cutting, chipping, or removing metal. The ship joiner uses the flat cold

Fig. 28 — *Socket-Paring Chisel*

chisel most frequently for chipping rough spots from flat metal surfaces, for removing burrs from metal edges, and for cutting metal of various kinds to a given size.

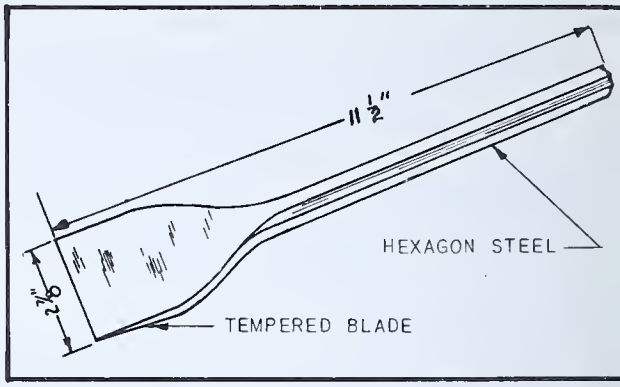


Fig. 29 — *Framing Chisel*

The cold chisel is a roughing tool. It is not used where great accuracy is required, but where the material to be removed is more than can be filed or where time and expense do not permit machining

The flat cold chisel is forged from tool steel of .75 to .85 carbon content The point of the tool is hardened and tempered to withstand the impact of heavy hammer blows and at the same time hold a sharp cutting edge. The cutting edge is ground on opposite sides to an angle of 70°. The edge also is ground slightly concave, as shown in Fig. 30.

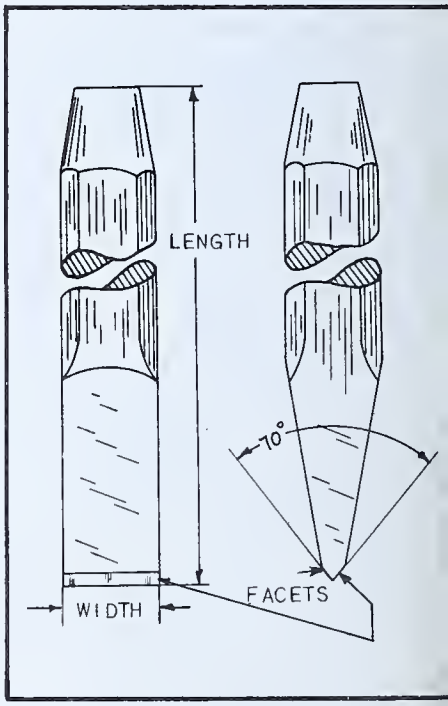


Fig. 30 — *Flat Cold Chisel*

Safety Precautions: Cold chisel heads after a time will become mushroomed on the top by ordinary use. This mushroom should be ground off before it becomes too large. Check your chisels frequently for cracks and breaks; flying pieces of steel are dangerous.

When chipping, always wear goggles, and avoid chipping toward anyone who is working nearby.

Claw Hammer

The claw hammer (see Fig. 31) frequently is used by the joiner. The peen end of this hammer is bent and forked so that it can be used for pulling nails. The face of the hammer is often slightly convex, or bell-faced, so that it will

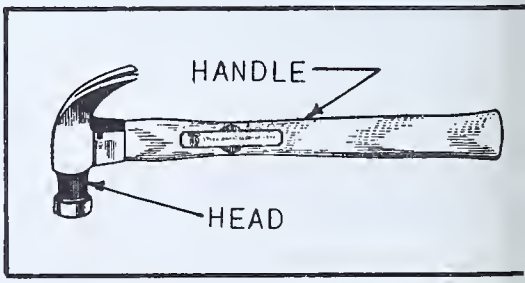


Fig. 31 — *Claw Hammer*

not make a circular mark on the surface of the wood with the last blow on the head of a nail. It is important to keep the face of the hammer clean and free from grease or glue to prevent its glancing off the head of a nail and bending it. The size of a hammer is indicated by the weight of the head in pounds and ounces.

The technique of striking with the hammer is one that must be mastered by the worker. When driving small nails, the workman uses the wrist to deliver the blow. (See Fig. 32). When driving large nails, he delivers the blow through the wrist, elbow, and shoulder.

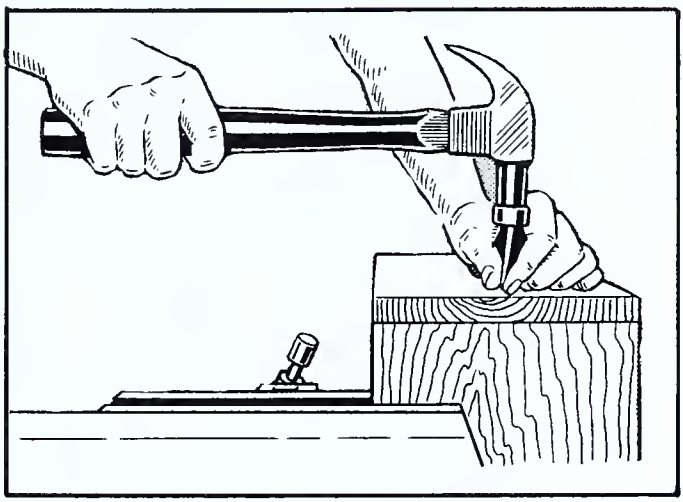


FIG. 32 — *Driving a Nail Correctly*

BALL PEEN HAMMER

A ball peen hammer (Fig. 35) is used by the joiner in doing metal joiner work where it is necessary to use a center punch or a cold chisel or in doing rough work on iron. Using the ball peen hammer for heavy work instead of a claw hammer will prevent the claw hammer from becoming "mushroomed" on the head. A mushroomed head materially reduces the usefulness of a claw hammer.

CORRECT USE OF HAMMER

A careful study of a hammer will show that the handle is evenly balanced in the head. The length of the handle may vary to suit the individual, but the hand should always grasp the handle close to the outer end and not up at the head end. Holding a hammer close to the head is called "choking the hammer". This is bad practice, and causes accidents.

SAFETY

Never strike a hardened surface with a hammer. The face and peen of the hammer are hardened, and the impact of hardened surfaces may cause the hammer to "spall". When a hammer "spalls", small chips crack off and fly. These flying bits of steel may result in eye injury or cuts.

Never use a hammer with a loose handle or a loose "wedge". The wedge is placed in the end of the handle to hold it tightly in the head. Never use the handle as a lever with which to lift or pry.

Correct Use of Hammer and Center Punch

Correct procedure in the use of hammer and center punch are described below:

1. When using a prick punch, strike a light blow or use a light hammer. A violent blow will break the point of the prick punch and cause the mark to be "off center". See Fig. 35.
2. When using a center punch, Fig. 33, use a heavier hammer. In most cases one blow with a hammer of the correct weight is quite sufficient to do the work. Never use a light hammer on a heavy center punch.
3. Hold the center punch square with the work unless it is necessary to "draw" the punch mark. See Fig. 35.
4. When using a heavy center punch, strike a light blow first to be sure the mark is "on center". Then set the mark deeper with a heavy blow.

Fig. 33 — *Center Punch*

Fig. 33 shows a common type of center punch. It has a hardened point.

←*Half size* heavy center punch. *Hexagon Steel.*

Fig. 34 shows a prick punch. The knurled body gives a better gripping surface for the fingers. The prick punch is smaller and shorter than a center punch. When striking the prick punch with a hammer, keep the punch straight up and down. When the center mark is not exactly true, lean the punch and "draw" the center over as shown.

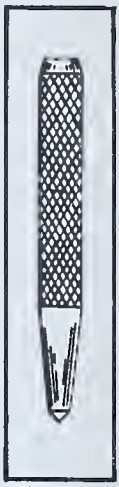


Fig. 34 — *Prick Punch*

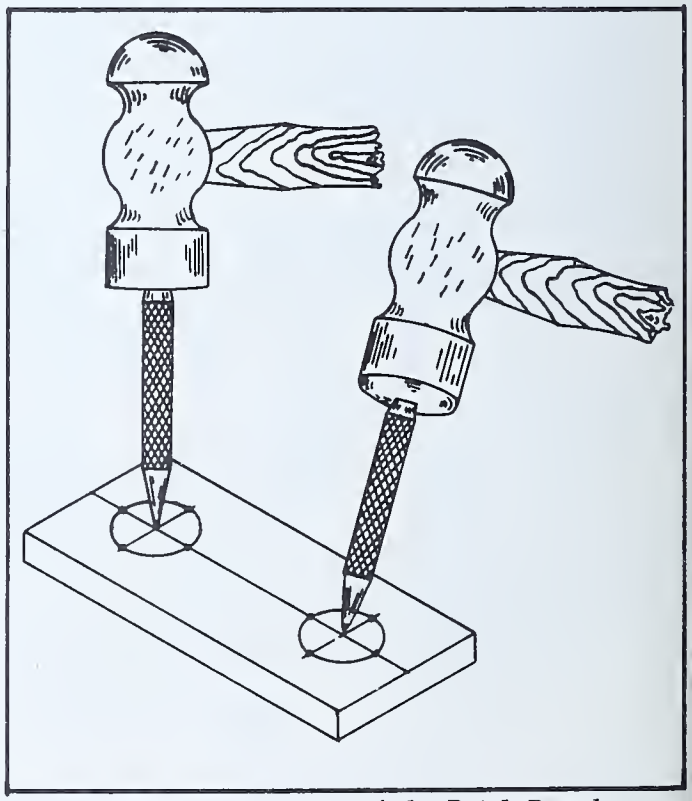


Fig. 35 — *Two uses of the Prick Punch and Ball Peen Hammer.*

Center punch sizes are given by letter in tool catalogs. Many mechanics, however, dress their center punches to suit their own requirements.

CAUTION

The top of the center-punch will "mushroom" after repeated use. Grind the mushroom off before it spalls and causes injury. See Fig. 33 for an illustration of good practice.

QUESTIONS

1. **Why should a hammer always be used instead of some makeshift?**
2. **State the correct way to hold a hammer and give reasons.**
3. **Explain why a hardened surface should never be struck with a hammer.**
4. **Point out the correct way to use a hammer with a prick punch. With a heavy center punch.**
5. **What is likely to happen to a prick punch if it is struck too heavy a blow?**
6. **Explain the different uses of the prick punch and the center punch.**

TOOLS (Continued)

NAIL SETS

Nail sets are small steel bars about 4″ to 5″ long and ¼″ in diameter. See Fig. 36. They have a cup shaped point, and are used to set nails below the surface. The size of the point varies with the size of the nail to be set. A portion of the bar is knurled to make it easy to hold.

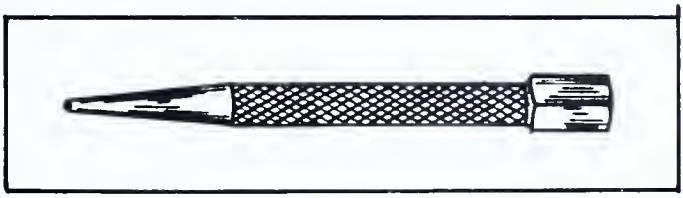


FIG. 36 — *Nail Set*

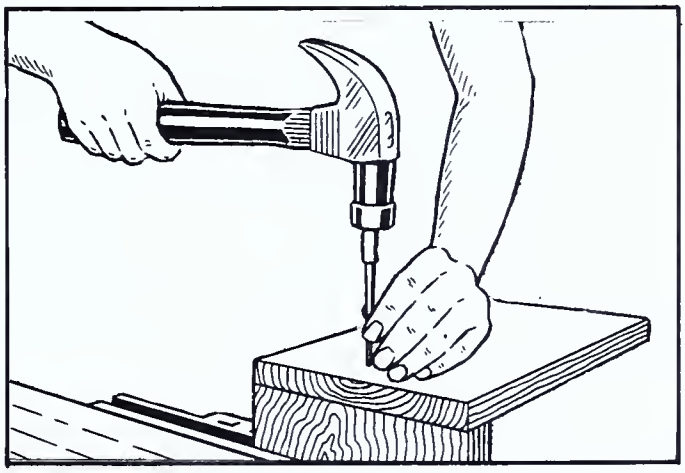


FIG. 37 — *Setting a Nail*

RATCHET BRACE

The brace (Fig. 38) is a tool used for holding an auger bit or drill securely and rotating it so that it will bore or drill a hole in work. A brace has four main parts: namely, (1) a chuck for holding the bit, (2) at the opposite end to the chuck a free-running knob, (3) a handle or crank, and (4) a ratchet attachment which permits boring in places where a complete

turn of the crank cannot be made. The size of braces is given according to the "sweep"; that is, the diameter of the circle that the handle makes in a complete revolution.

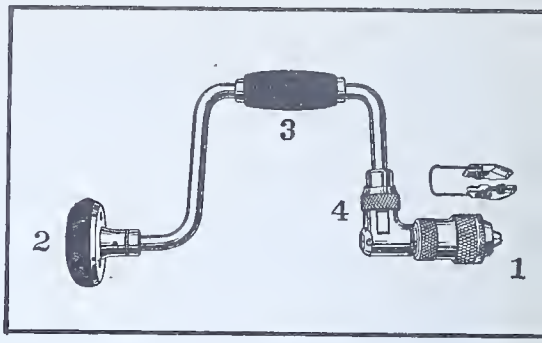


FIG. 38 — *Brace*

AUGER BITS

Auger bits (Fig. 39) are screw-shaped tools consisting of two main parts, the twist and the shank. The twist ends in two sharp points, termed the nibs or spurs, which score the circle. There are also two cutting edges or lips which remove the shavings from within the scored circle. A small screw point in the center of the cutting end centers the bit and draws it into the wood. The shank ends in a square-tapered tang, which is held by the chuck of the brace. The size of an auger bit is indicated in sixteenths of an inch, and is stamped on the tang.

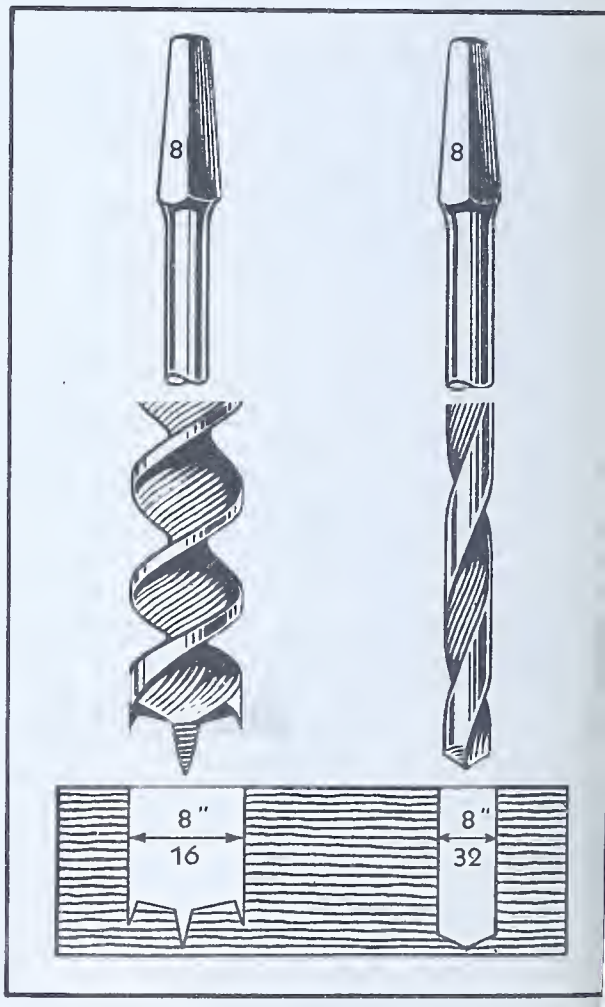


FIG. 39 — *No. 8 Auger Bit and No. 8 Twist Drill*

Examples: Number 12 stamped on the tang indicates 12/16″ or ¾″; number 8 signifies 8/16″ or ½″; and so on. Auger bits in an ordinary set range is size from 3/16″ to 1″. See Fig. 39 for indicated sizes.

Drill Sizes: Ordinarily, drill sizes are stamped on the shank in fractions of an inch. For example ¼″, 21/32″, 41/64″, etc.

WOOD DRILLS

Wood drills (Fig. 39) range in size from 1/16″ to ⅝″ by thirty-seconds

A number is stamped on the tang. In this case the number 8, for example, stands for 8/32.

Expansive Bit

Expansive bits (Fig. 40) have a moveable cutter which is adjustable for boring holes of different diameters. Expansive bits are made in several sizes. The largest size has three cutters, and bores holes up to 4 inches in diameter.

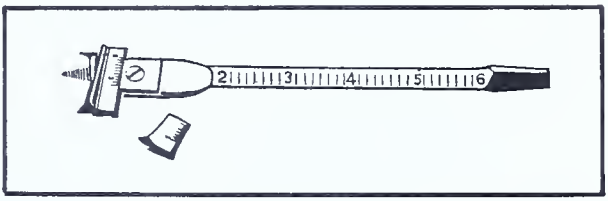


Fig. 40 — *Expansive Bit*

Countersink

The countersink (Fig. 41) is a small, coneshaped tool used for widening the ends of holes bored for flathead screws.

Automatic Screwdrivers

Automatic screwdrivers are built on the same principle as automatic drills. A ratchet arrangement permits them to drive in one direction and release in the other direction. The best type can both drive and withdraw screws. It can also be locked and used as an ordinary screwdriver.

Fig. 41 — *Countersink*

Screwdriver Bits

Screwdriver bits (Fig. 42) are screwdriver blades, the upper ends of which have been forged to a square tapered shank. They are used with a brace. These bits are 5″ long and from ¼″ to ½″ wide at the point.

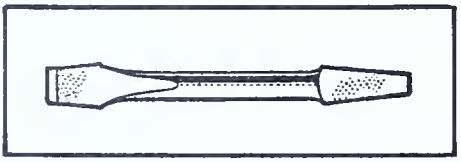


Fig. 42 — *Screwdriver Bit*

Twist Drills

In metal joiner work all screws require pilot holes. The pilot hole is drilled with a twist drill (Fig. 43). The twist drill is held in a chuck on a joiner hand drill which is operated either by air or by electricity.

Fig. 43 — *Twist Drill*

Automatic Hand Drill

The automatic drill (Fig. 44) is so constructed that when pressure is applied to the handle its bit is revolved by the the action of a slide following a

spiral groove inside the barrel of the tool. When pressure is released from the handle, it automatically returns to its former position. The handle of this drill serves as a magazine for holding several various-sized bits.

FIG. 44 — *Automatic Drill*

ADJUSTABLE WRENCH

The open-end wrench is usually preferred to the adjustable type; the adjustable wrench, however, is more convenient on some jobs. The adjustable wrench is usually thicker than the solid wrench, but it has the advantage of being adjustable to fit a variety of nut sizes. See Fig. 45.

A common disadvantage of the adjustable wrench is that it will slip off the nut more easily than the open-end wrench. The adjustable-jaw threads wear readily, and consequently permit free movement of the jaws when pressure is applied.

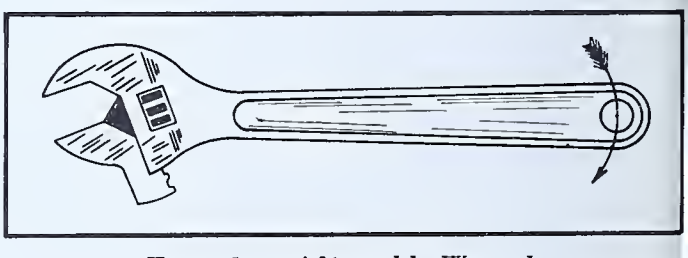


FIG. 45 — *Adjustable Wrench*

The adjustable wrench is applicable for use on light work where a variety of nut sizes is being used.

NOTE: Never use an adjustable wrench for a hammer.

DIVIDERS

Dividers are made in many sizes and in many styles. The Yankee-pattern divider, shown in Fig. 46, is most commonly used. The points are hardened, and great care must be taken not to break these important parts of the divider. Close work cannot be done with stubby divider points. A cork pressed on each point will help to keep them in good shape.

Dividers are used to scribe circles, find centers of circles, divide distances into equal spaces, and perform similar operations. Lay the dividers down as flat as possible when setting them to scale dimensions. This position saves the points, and at the same time affords greater accuracy. See Fig. 47.

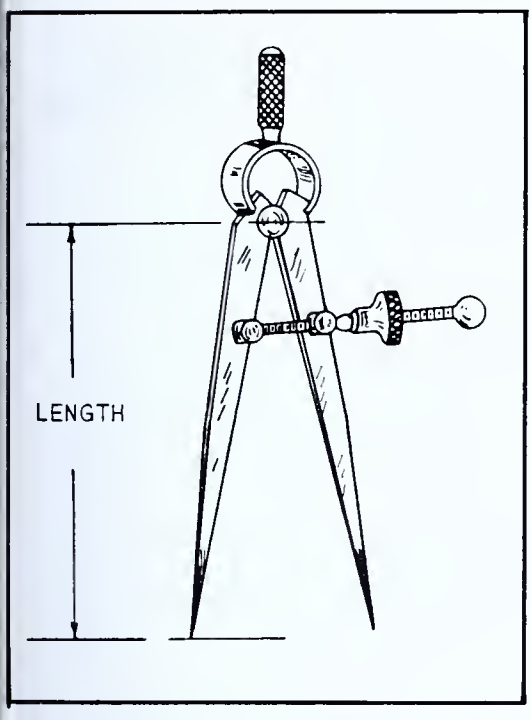


FIG. 46 — *Typical "Yankee"-pattern spring dividers, with hardened points and screw adjustment. Dividers with dull or broken points are useless.*

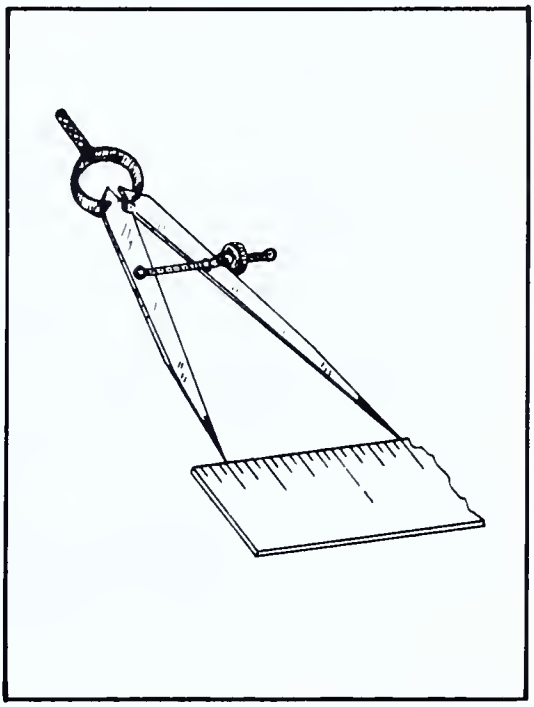


FIG. 47 — *Yankee Pattern Dividers, set to 1¼" on the scale. Always lay the dividers down flat, with the points in graduation marks. Doing this will protect the points from being dulled and permit a closer setting because a clear view may be had of the scale and the divider points.*

QUESTIONS

1. **What tool is used to make a circle?**
2. **Explain why it is necessary to keep divider points sharp.**

TOOLS (Continued)

PLIERS

The usual type of pliers used by the joiner in installing insulation are known as "side cutting" pliers. See Fig. 48. The hardened-steel cutting edges are used to cut soft wire (steel or copper), small nails, screws, and so on. The flat nose allows the tool to be inserted in a fairly narrow place to "nip on" to a wire or other piece of material and pull it out.

The jaws are usually serrated (finely grooved), and the pliers may be used to "crimp" thin sheet metal. The serrations prevent the jaws from slipping. (The

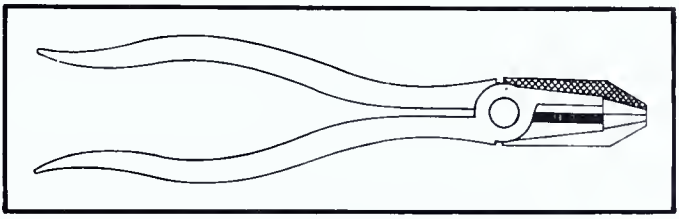


FIG. 48 — *"Side-Cutting" Pliers*

instructor will demonstrate different ways of using pliers). It is not good practice to use this type of pliers to tighten or loosen nuts. Use a wrench. Never use the cutters to cut hard wire. When the cutters are nicked they are useless. The pliers shown in Fig. 49 are termed gas pliers. They are frequently used by the joiner.

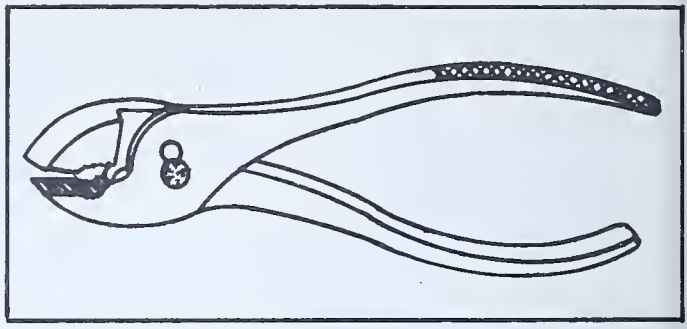


Fig. 49 — *Gas Pliers*

Tin Snips

The tin snips, Fig. 50, are a sheet metal worker's tool, but at times are also useful to a joiner in cutting soft wire, screening, and sheet metal.

Never cut hard wire, large nails, or small rods with tin snips, for so doing causes the loss of "shear". Hard wire nicks the cutting edges and makes it impossible to cut thin materials satisfactorily. Tin snips are available in several sizes and styles. Use the correct type and size for the job at hand.

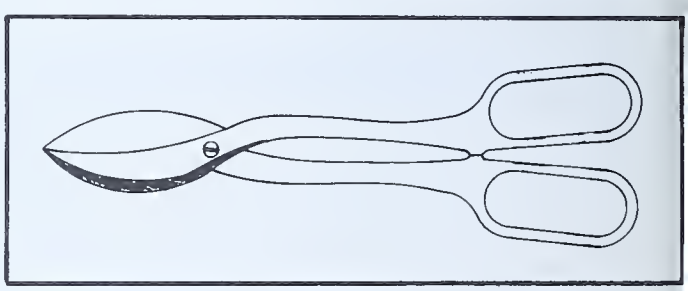


Fig. 50 — *Tin Snips*

Level

The level (see Fig. 51) is very little used by the joiner. Since he does have need for a level occasionally, the joiner should carry it in his tool box. One example of a joiner's need for a level is in setting stairs.

When the bubble of a level is exactly between the two hair lines on the glass, the surface upon which the level rests is level. Some levels having three glasses (Fig. 51) may be used to plumb a perpendicular. (The instructor will demonstrate the uses of a level).

There is a glass level in the square head of a combination square. The head and blade may be used for a plumb, or the head alone may be used for a level on

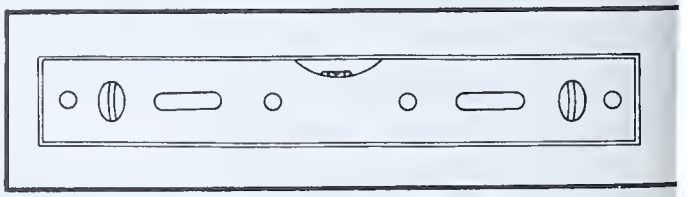


Fig. 51 — *Level*

short surfaces of a job. For accuracy, always use the longest level possible.

Plumb Bob and Line

A level cannot be used in leveling vertical distances where a point several feet below must be lined up with a fixed point above. In this case it is necessary to use a long plumb line that is, a heavy cord with a weight on the bottom end to hold the line taut. See Fig. 52. The weight is called a "bob" and the line is know as a "plumb line". As the illustration shows, the plumb bob is pear-shaped, with the small, pointed end hanging down. The plumb bob should be sufficiently heavy to prevent "swing".

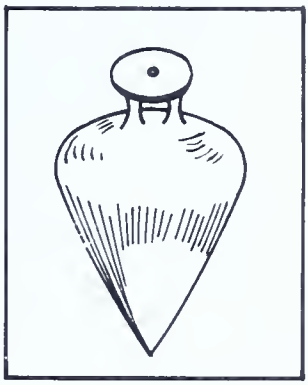


Fig. 52 — *Plumb Bob*

The point of the plumb bob will land directly over the location when the upper end of the line is held on the top. A location at the top of the work may be laid off from a point below by means of the bob, but it is usual to work from the top down. After the line has been located, it is possible, using the plumb line as a center line, to measure off at right angles to the plumb line in any horizontal direction. (The instructor will demonstrate the use of a plumb bob and line.)

Chalk Line

A chalk line is a heavy, woven-cotton cord. Keep the chalk line in the tool box when not in use. Chalk lines are used to line up furring and to "snap" lines on a deck or bulkhead. In using the line, chalk it well, stretch it taut between the given points through which a straight line is to be drawn, and then pick it up about midway between the two points and release it sharply. The line will snap to the original position and leave a chalked line on the surface of the work.

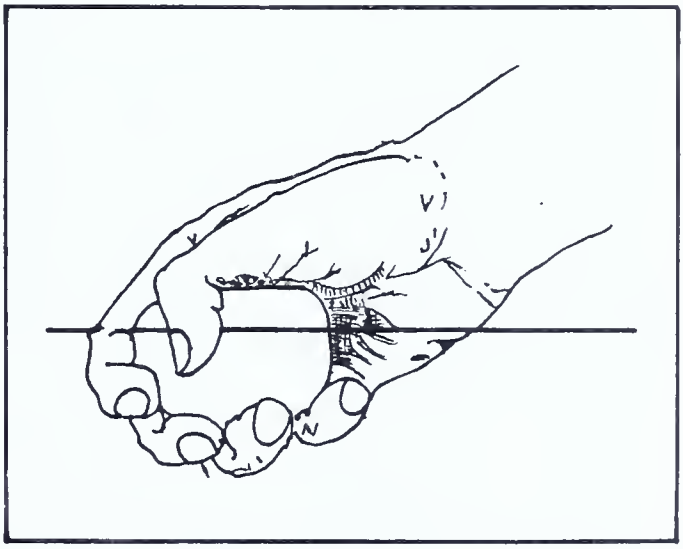


Fig. 53 — *Chalking a Line*

The correct procedure for chalking a line is to use the

chalk on the line without wearing a groove in the chalk. Grooves in the chalk will eventually break it and make it useless for chalking a line. Hold the chalk in the palm of the hand with the flat surface exposed. The line rests on the flat surface of the chalk with the thumb on the line and the chalk. See Fig. 53. With the line stretched, pull the chalk along the line, moving the thumb back and forth so that the line will move over the surface of the chalk and remove chalk from the entire surface without wearing grooves in it.

Butt Gauge

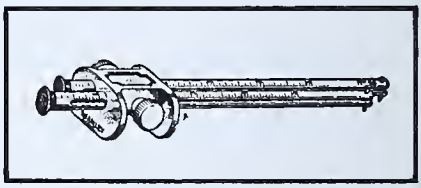


Fig. 54 — *Butt Gauge*

The butt gauge (Fig. 54) is a very useful tool to carry in the kit. This type of butt gauge can be used for laying out mortise and tenon joints and for gauging the width and depth of the cut-out for the hinges on a door and door jamb. It is made of steel and consists of a head and two bars. On one end there are movable wheels which cut a line; on the other end there are two spurs which scribe a line.

Carborundum Stones

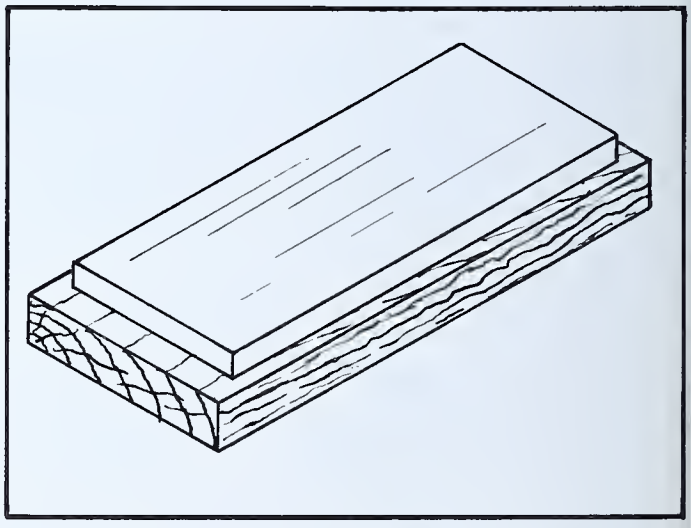


Fig. 55 — *Carborundum Oil Stone*

A carborundum stone (sometimes called *whet*stone or *oil*stone), (Fig. 55) is necessary so that the mechanic may keep chisels, plane irons, etc., in cutting shape.

C-Clamps

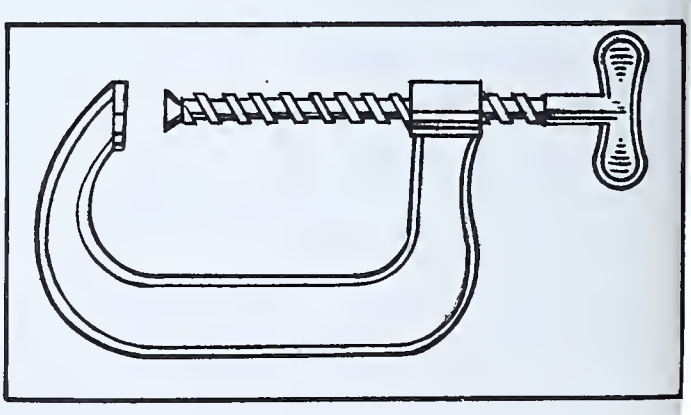


Fig. 56 — *C-Clamp*

C-clamps, or screw clamps as they are sometimes called, consist of a malleable-iron frame cast in the shape of the letter C, and a steel screw with a swivel tip. See Fig. 56. They are made in sizes which, when open,

measure from 3″ to 12″. The C-clamp is useful to the joiner when he is erecting furring or top and bottom shell shoe. The material can be clamped in place for the welder and thus eliminate the possibility of its moving before it is welded fast.

Wood Rasp

The surface of a rasp is covered with rough, triangular points or projections, called "teeth". See Fig. 57. A wood rasp is used by a joiner for reducing and smoothing wood edges that cannot be worked with a cutting tool. The method of using a wood rasp is the same as when using a file.

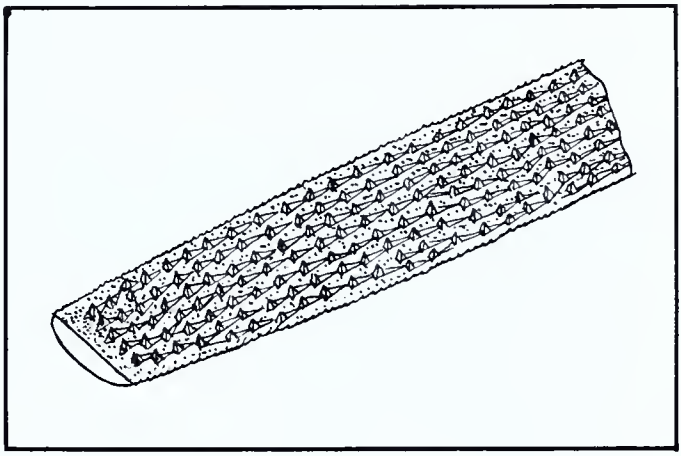


Fig. 57 — *Wood Rasp*

Files

Files have two very important purposes: (a) smoothing metal surfaces, and (b) changing the size and shape of metal pieces. A job of good filing adds to the appearance of the finished work. File marks are almost always impossible to remove by sandpapering or polishing with emery cloth. Correct filing will leave the work smooth and free from unsightly scratches.

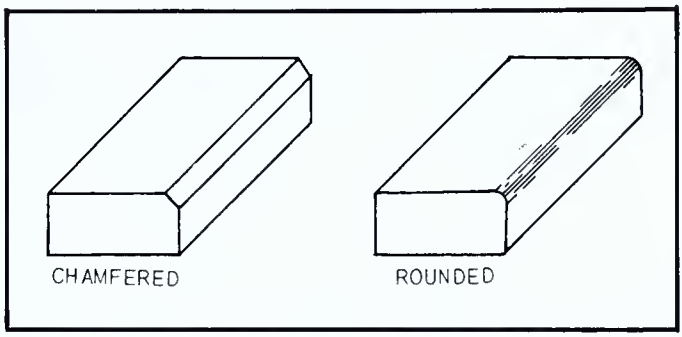


Fig. 58 — *Corner Shapes*

The joiner must file off sharp corners. Burrs on bolt ends, edges of steel plates, burrs on drilled-hole edges, and many other smoothing jobs may be done with a file. Many metal parts must be fitted when the mechanic assembles or installs units and parts aboard ship. Some of these jobs include setting doors, installing trim, setting furniture, and installing locks.

Types and Sizes of Files

There are a great many types and sizes of files available. Since the joiner uses comparatively few types and sizes, only the commonly-used files are

mentioned. In Fig. 60, the cross sections of five files are shown. These cross-section dimensions vary in proportion to the length of the file, but the shape remains the same.

The length of a file is taken from heel to point. See Fig. 59.

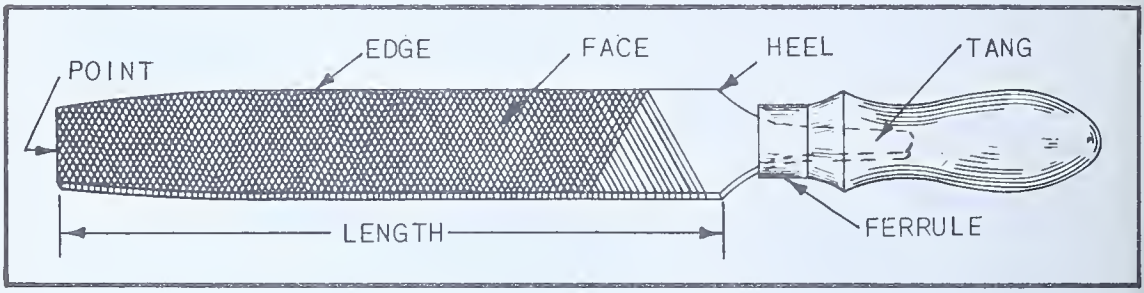


FIG. 59 — *Parts of a File*

As shown in Fig. 59 the file tapers from about the center to the point. The faces of these files are slightly "bellied". One reason for this taper is that it is almost impossible to file a surface flat if the file is perfectly straight. Another reason for the lack of flatness is that all files are made of high-carbon steel, and after being "cut", (as explained below) they are hardened.

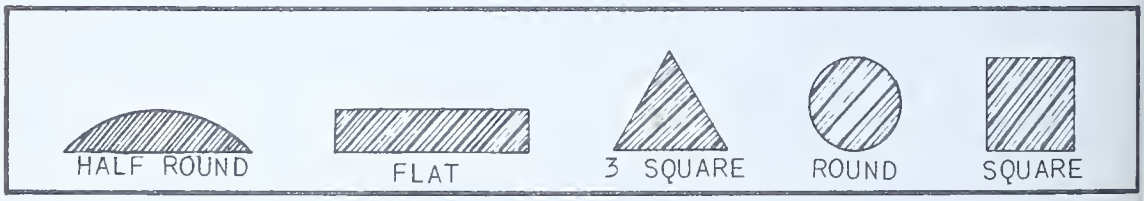


FIG. 60 — *Sections of Files*

The hardening process sometimes results in a slight "draw" or curve in the length of the file. If the files were the same thickness throughout the length, it is easy to see that a slight curve would make one side rounding and the opposite side hollow.

FILE HANDLES

Use file handles at all times. See that the handle fits snugly and without wobble.

Do not use a split file handle or a file handle without a ferrule. Hammering on a file handle is poor practice; avoid it.

File Cuts and Uses

Files are necessarily rough in order to make them cut. Close examination of a file with a magnifying glass will reveal many fine "teeth" on the file surface. These teeth are formed when the file is "cut".

A sharp, chisel-edged, hardened tool in a special machine cuts the teeth on a file before the file is hardened. Fig. 61 shows the highly enlarged surface of a bastard file and a second-cut file.

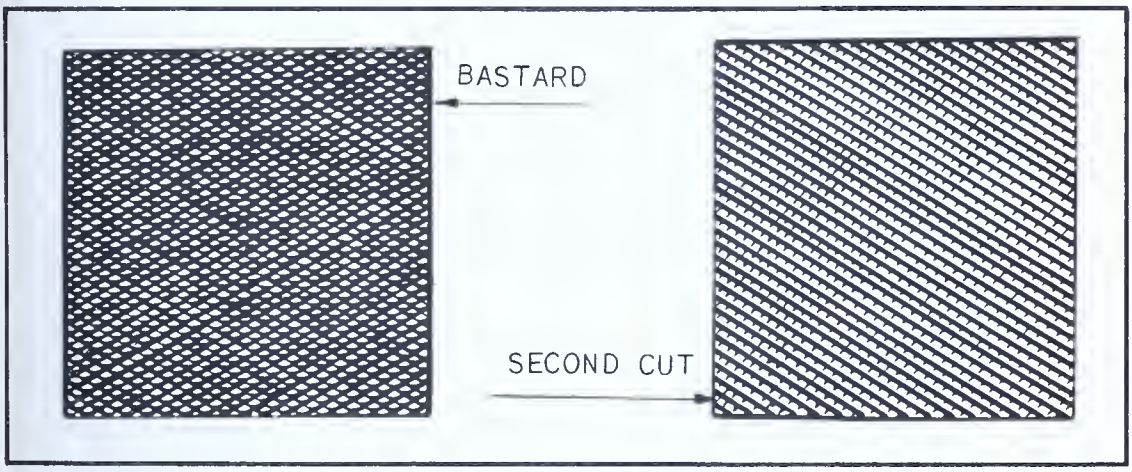


Fig. 61 — *Bastard and Second-Cut File Surfaces*

The names of the cuts indicate the spacing of the teeth rows. A bastard file has teeth spaced farther apart than a second-cut file has. The term "second-cut" means there are two rows of teeth in about the same distance as one row of teeth on a bastard file. The second-cut file is finer than a bastard file but not so fine as a mill file.

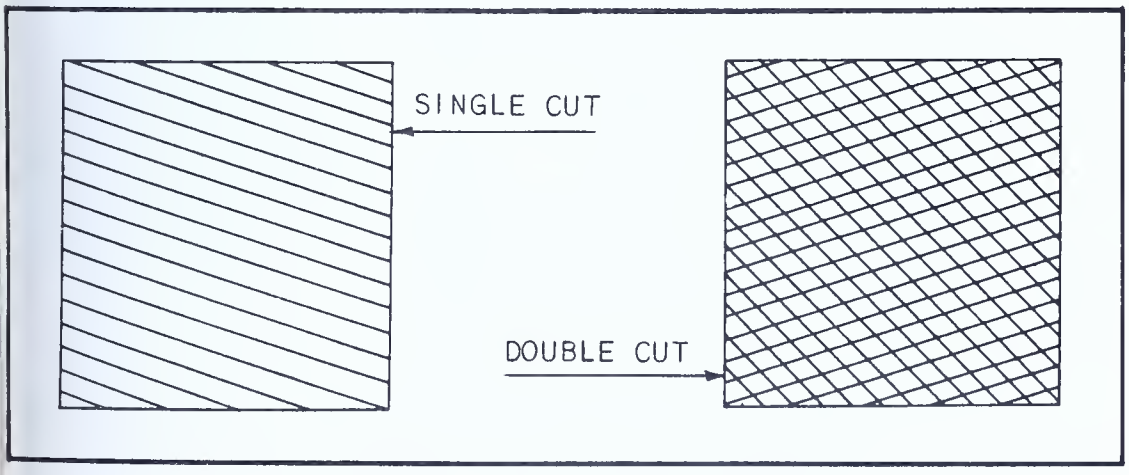


Fig. 62 — *Single-Cut and Double-Cut File Surfaces*

Both the files named above are "double-cut", which means that there are two rows of cuts or teeth on the full length of the file. Looking at the point or the heel of a file, it may readily be discovered whether the file is "single-cut" or "double-cut". See Fig. 62.

QUESTIONS

1. **For what purpose or purposes are files used?**
2. **Name some of the jobs which require the use of files.**
3. **State the types of files which are usually found to be satisfactory for the work of the joiner.**
4. **In roughing off burrs or fins, what type of file should be used?**
5. **Why does the mechanic keep one or two files especially for use with brass?**
6. **Name one or two jobs where a half round bastard file would be very useful.**
7. **What are two safety rules to follow when using a file?**
8. **What effect does oil have on the correct use of a file?**
9. **Explain the cause of "pinning", the results, and how to prevent it.**

Part III
EQUIPMENT

The following pieces of equipment are furnished by the company for the joiners to use when working on board the ship. From left to right the pieces are named:

1. Angle and tee cutter.
2. Novelty shears.
3. Portable electric grinder.
4. Trestle.
5. Air drill.

Fig. 63 shows these pieces of equipment. The use of this equipment is mentioned at various places in the manual as the need for the particular piece of equipment arises.

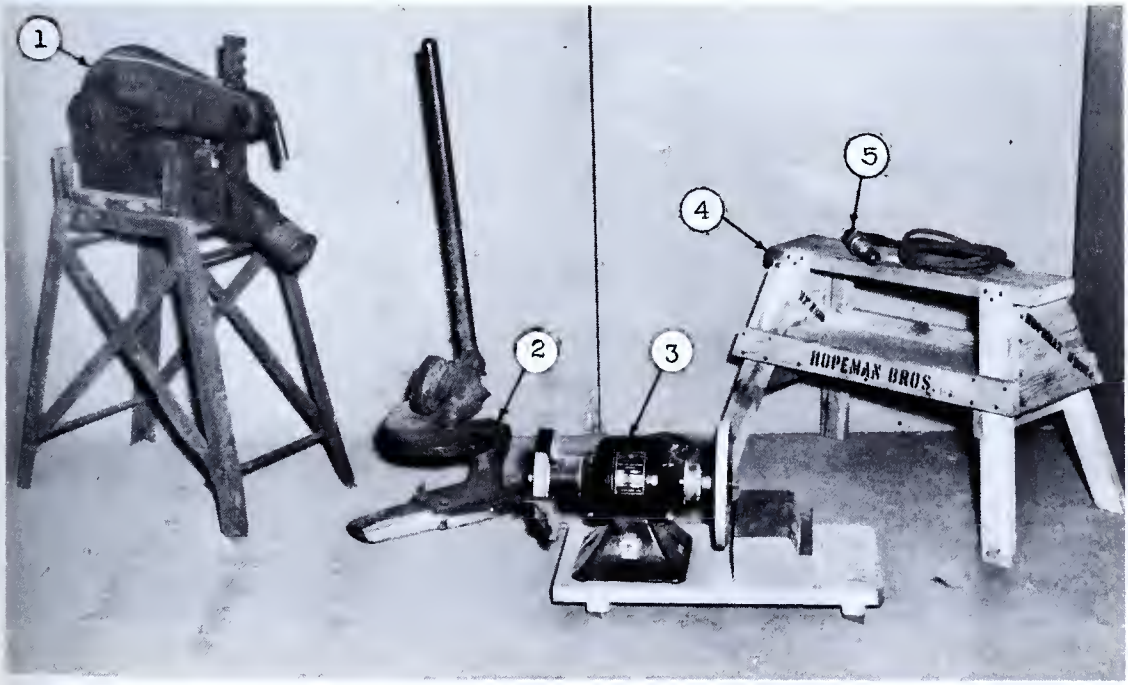


FIG. 63 — *Equipment used by the joiner*

Part IV
JOB PROCEDURES IN SHIP JOINERY

JOB SHEET NO. 1
LAYING OUT ROOMS, AND BATHROOMS

General Information

The joiner's layout work opens the way for other craftsmen to begin their work. The layout man begins his work just as soon as the decks are set and the houses are in place. The pipefitters, electricians, and other mechanics may proceed with their work as soon as the joiners have completed laying out the locations of bulkheads, and openings.

Fig. 64 — *Section of a Deck Showing the V from which the Center Line is located*

The layout man must work accurately; he must be able to read a blueprint correctly and to make decisions covering details of his work.

Tools

1. 6′ Rule
2. Straight Edge
3. Steel Tape
4. Center Punch
5. Ball Peen Hammer
6. Chalk Line
7. Blueprint

Supplies

1. Chalk
2. Soapstone

Safety Suggestions

Work safely. Many hose lines and other obstacles will be encountered and these obstructions must be avoided. Remember that nearly everything on the ship is only temporarily set at this stage.

Procedure

1. Establish the center line of the ship on the deck.

   The center line of the ship is determined by referring to the markings on the forward shell of the deck house. The center punch marks representing the center line of the ship are found within the painted "V" on the shell, as shown in Fig. 64.

   Locate the center line on the deck by holding a steel square or plumb bob in line with these markings and then making a chalk mark on the deck. See Fig. 65. Repeat this procedure on the after shell of the deck house. Stretch a chalk line between center marks made on the deck and snap it, thereby establishing the center line of the ship on the deck.

2. Locate the longitudinal center lines of the intermediate bulkheads for the rooms and passageways. See Fig. 64.

   Note that the center lines in Fig. 75 are the center lines for the layout of the rooms shown in Fig. 64.

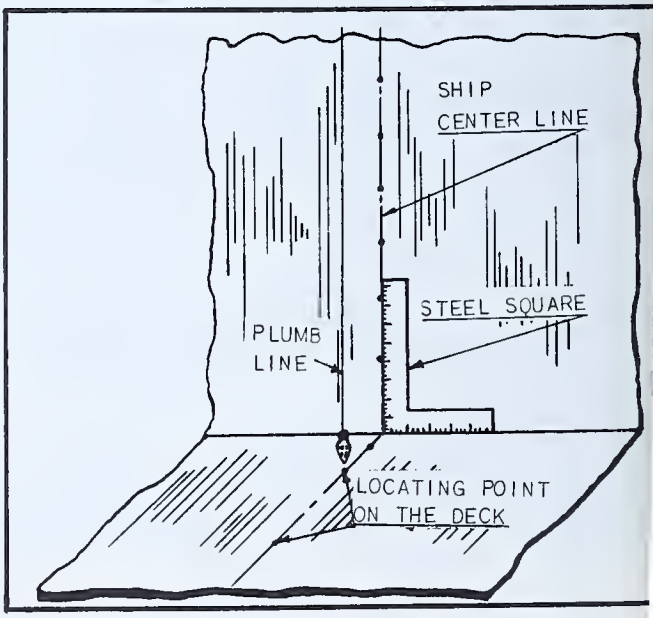


Fig. 65 — *Locating Center Line on Deck*

Measure the required distance, according to blueprint specifications, to port and starboard from the center line of the ship to locate the longitudinal center lines of rooms and passageways.

3. Locate the athwartship center lines of the intermediate bulkheads for rooms and passageways.

Measure the required distances, according to blueprint specifications, forward or aft from the specified frame lines to get the athwartship center lines and the locations of intermediate bulkheads.

4. Lay off the width of the bottom iron "intermediate shoe" "a" and bathroom coaming "b" (Fig. 75) on the center lines established for intermediate bulkheads.

Divide the thickness of the bottom iron in half and lay off this distance on either side of the center line as shown in Fig. 66. Strike chalk lines to establish these lines.

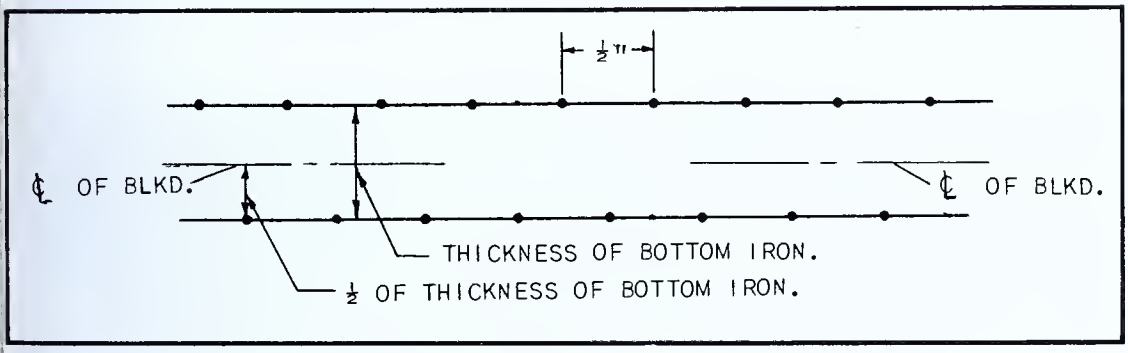


FIG. 66 — *Layout for Bottom Iron*

5. Check the location of these lines by again referring to the print and remeasuring the distances.

6. Center punch the established bottom iron lines spacing the center punch marks approximately ½" apart. Center punch marks should also be staggered as shown in Fig. 66.

QUESTIONS

1. **Why is the joiner spoken of as a "pioneer" for many of the crafts?**
2. **Why should the layout man be able to read a blueprint accurately?**
3. **How can the center line of the ship be located?**
4. **Why are the lines to which reference is made in "Step 6" center punched?**

JOB SHEET NO. 2
LAYING OUT AND INSTALLING INSULATION PINS

General Information

Pins are installed for the purpose of supporting insulation which is placed between the ship shell and the wire lath. Special clips are used to hold the insulation and wire lath in place over the pins. See Figs. 67 and 68. The services of a welder will be needed when the insulation pins are welded in place.

Have the welder weld the pins on the thin side. See Fig. 69. (This will be demonstrated by the instructor.) The pins are welded on the thin side to prevent the legs from being burned off of the pins. The blueprint will show that insulation is installed on surfaces that are exposed to the weather. For example: Insulation is installed on the inside surface of the shell of the ship when the shell forms one wall of the room.

Fig. 67 — *Layout for Insulation Pins (Pins are welded in place)*

Materials

Insulation pins as shown on the drawing detail.

Tools

1. 6′ Rule
2. Chalk
3. Gloves
4. Dark Glasses

Equipment

Stick for holding pins to be welded. See Fig. 70, a.

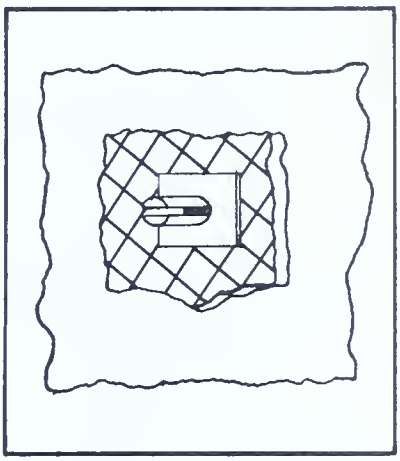


FIG. 68 — *Insulation Pin, Wire, Insulation, and Special Clip*

SAFETY SUGGESTIONS

When holding the pins to be welded gloves should be worn to protect the hands, and dark glasses to protect the eyes.

PROCEDURE

1. Determine the surfaces to be insulated. (Refer to the blueprint.)
2. Lay out the locations of the pins. Pins are located approximately 3¼″ away from stiffeners and about 18″ apart.
3. Insert pin in wooden holder and hold in position for welding. See Fig. 71. Be sure to set the pins so that the pin legs will bend with the length of the "diamond". Fig. 72.

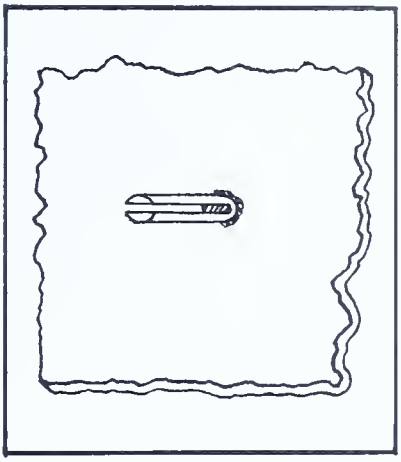


FIG. 69 — *Insulation Pin Welded to Shell*

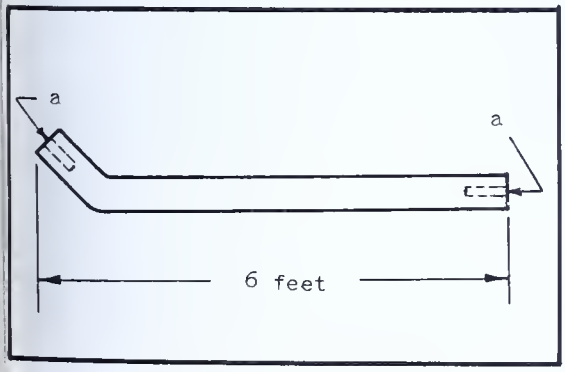


FIG. 70 — *Pin Holder Stick*

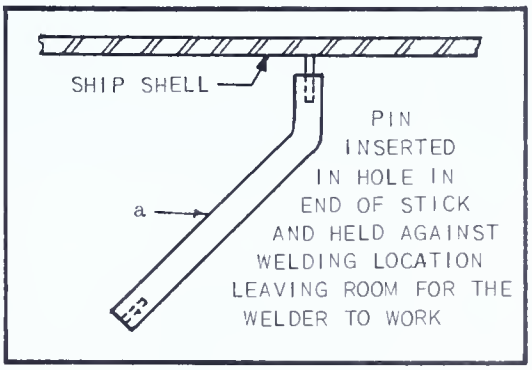


FIG. 71 — *Using a Holder Stick*

QUESTIONS

1. Why is it important to wear dark glasses when working with a welder?
2. Why should gloves be worn when performing this operation?
3. Why should the pins be welded on the thin side as demonstrated?

JOB SHEET NO. 3
INSTALLATION OF INSULATION

General Information

Insulation clips, or hairpins as they are called by the trade, are welded to the bulkhead in the proper place as indicated on the blueprint. Only the bulkheads and ceiling that are exposed to the weather are insulated.

The novelty shear is a tool designed for cutting sheet metal. Several of these shears will be found on a boat; they are placed by the leader at convenient places, so that several men may use one tool.

Materials

Pads of insulation 24″ x 30″ x 2″ thick. Wire lath 30″ x 90″. Insulation plates.

Note: These materials will be found in the room to which the joiner is assigned to work, or on the deck near by.

Tools

1. Hack saw blade
2. 6′ Rule
3. Pair cutting pliers
4. Claw hammer

Equipment

Novelty shears
Saw horse

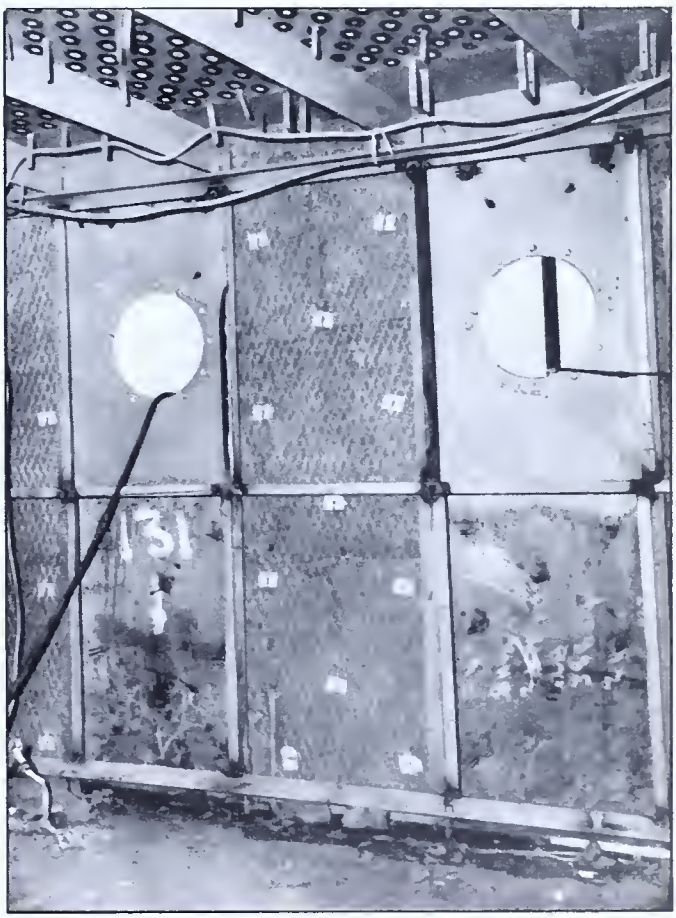


Fig. 72 — *Insulation in place*

Safety Suggestions

Use a saw horse on which to stand. Never stand on a bucket or box. Never step backwards off of a saw horse. Use pliers in bending the pins. Do not use a hammer.

PROCEDURE

1. Measure the space to be insulated.
2. Cut a piece of insulation to the required size, using a hack saw blade of a suitable length. A hack saw frame is not used.
3. Press the insulation over the pins, making sure all the surface is covered.
4. Cut a piece of wire lath the required size. This need not be a tight fit; about ¼″ clearance may be allowed around the edge. Use the novelty shears for cutting the wire. If it is necessary to fit the wire around any obstacles, the wire may be cut with a pair of cutting pliers.
5. Place the wire in position over the insulation.
6. Place an insulation clip in the jaws of the pliers and bend the edge of the clip down, thus making it easy to hold. Clip over the pin. See Fig. 68.
7. Bend the pin over the clip as shown in Fig. 74 thus holding insulation, wire, and lath in place.

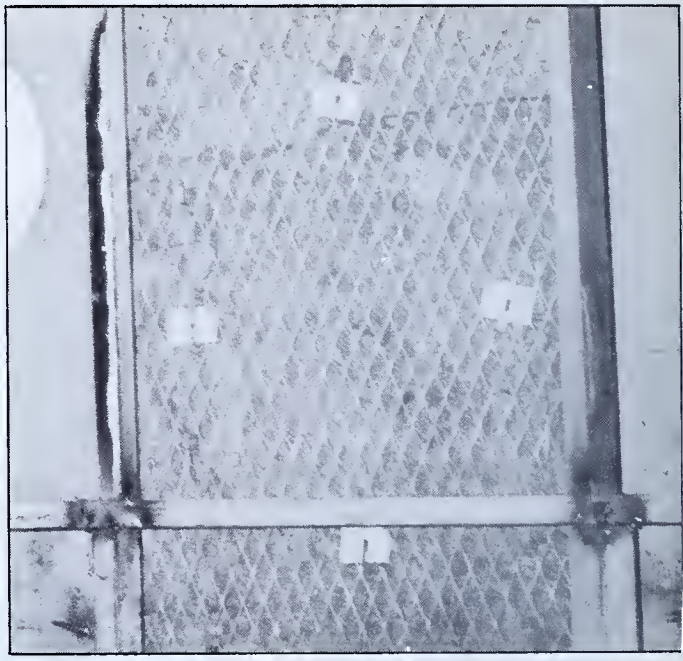


FIG. 73 — *Section Showing Insulation in Place*

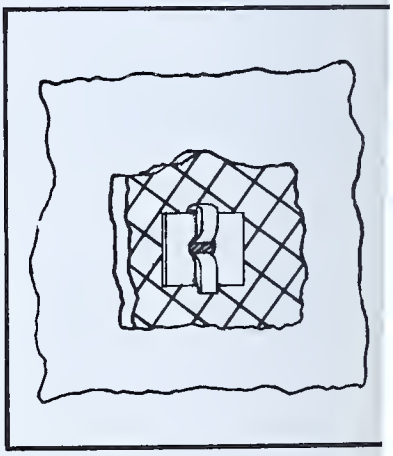


FIG. 74 — *Pin bent over top of Clip*

QUESTIONS

1. **Why is it necessary to insulate the rooms on a ship?**
2. **State the location of the surfaces that are insulated.**
3. **Why must stepping backwards from a saw horse be avoided?**

JOB SHEET NO. 4
INSTALLING BATHROOM COAMING, Z-BAR AND INTERMEDIATE SHOE

General Information

The bathroom coaming is installed by the shipfitter under the direction of the joiner. The services of a welder and a burner will be needed to cut the coaming and to weld it in place. See Fig. 75. The intermediate shoe also is installed by the shipfitter under the direction of the joiner. The Z-bar is installed by the joiner, and then is welded to the coaming to receive the bottom of the bathroom panels. See Fig. 76. The locations for the numbers shown in Fig. 76 are laid out on the deck as shown in Fig. 75.

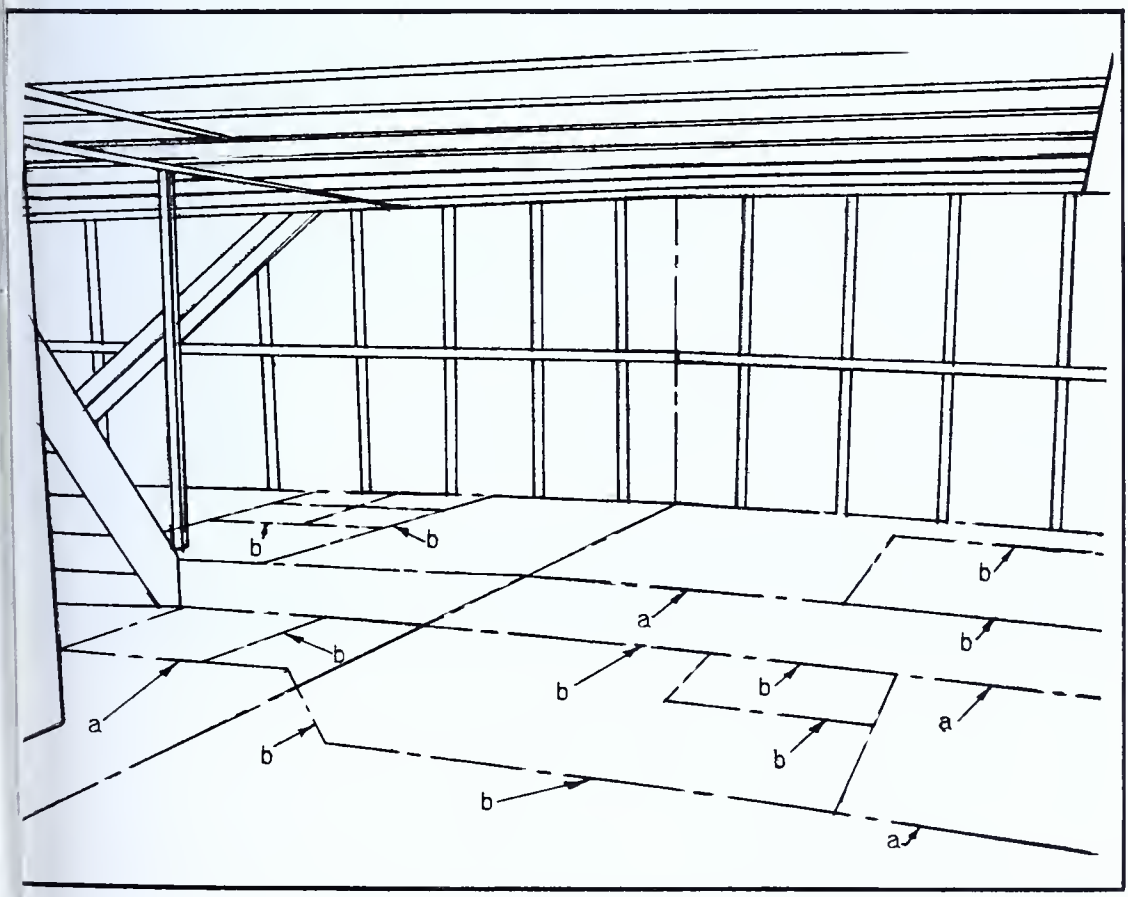


Fig. 75 — *Position of Intermediate Shoe at (a) Bathroom Coaming at (b)*

Materials

Bathroom coaming flat steel bar stock according to drawing detail, Z-bar—as per detail, intermediate shoe according to drawing detail.

Tools	Supplies
1. 6′ Rule	Hack saw blade
2. Level	
3. Straightedge	
4. Hack saw	
5. File with handle	

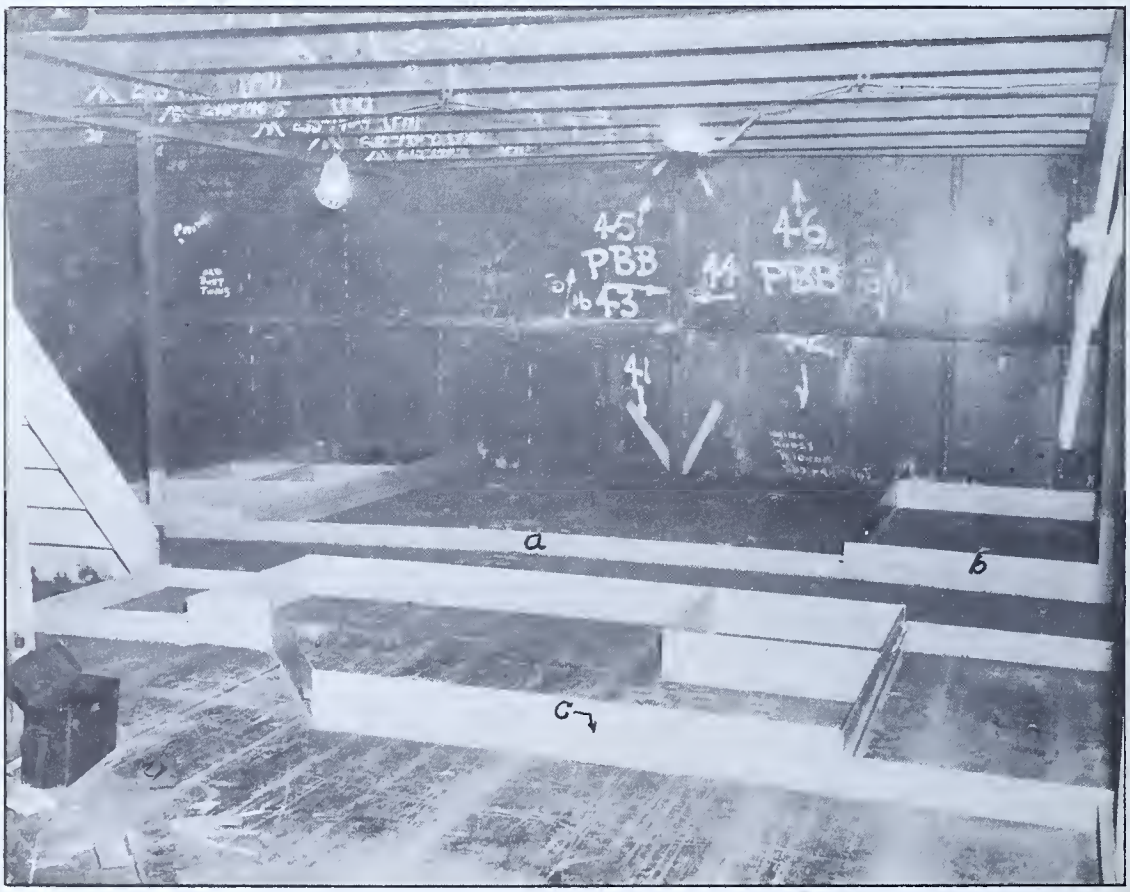


Fig. 76 — *Intermediate Shoe "a", Bathroom Coaming "b", Bathroom Z-Bar "c"*

Safety Suggestions

Work carefully. Wear dark glasses. Watch the movements of the burner and welder to avoid receiving burns, or a flash from the torch.

PROCEDURE

1. Install the coaming first according to the layout shown in Fig. 75. It is tacked to the deck and then welded as shown in Fig. 76.
2. Measure the length of the intermediate shoe which is needed. (Measure the layout on the deck. Fig. 75).
3. Have a burner cut the shoe piece to length.
4. Tack in place on the layout.
5. Check the work for location and workmanship.
6. Locate the Z-Bar.
7. Cut the Z-Bar to the required length with the hack saw.
8. Have the pieces of Z-Bar welded in place.

QUESTIONS

1. **Where is coaming installed?**
2. **What is the purpose of coaming?**
3. **For what is the intermediate shoe used?**
4. **Of what use is a Z-Bar?**
5. **State the location of the Z-Bar.**

JOB SHEET NO. 5
INSTALLING OVERHEAD INTERMEDIATE FURRING

General Information

Furring is the term applied to the strips of metal which are used to form an even base on which to install the framing for intermediate bulkheads and partitions.

There are two kinds of overhead intermediate furring. One is a channel iron used generally to take the place of a beam for supporting panels. See Fig. 78 at "a". This channel iron is the same width as the beam used. The other type of furring is an angle iron used where a beam is in the line of a panel. See Fig. 78 at "b". The angle iron is welded to the beam.

Fig. 77 — *Intermediate Furring*

Materials

Channel furring according to the drawing detail. Angle iron furring according to the drawing detail.

Tools

1. 6′ Rule
2. Hack saw
3. Straight edge
4. Square
5. Several C-clamps
6. Chalk line

Safety Suggestions

Use the saw horse to stand on. Always avoid stepping backwards from a saw horse. Take care to avoid the flash from the welder's torch.

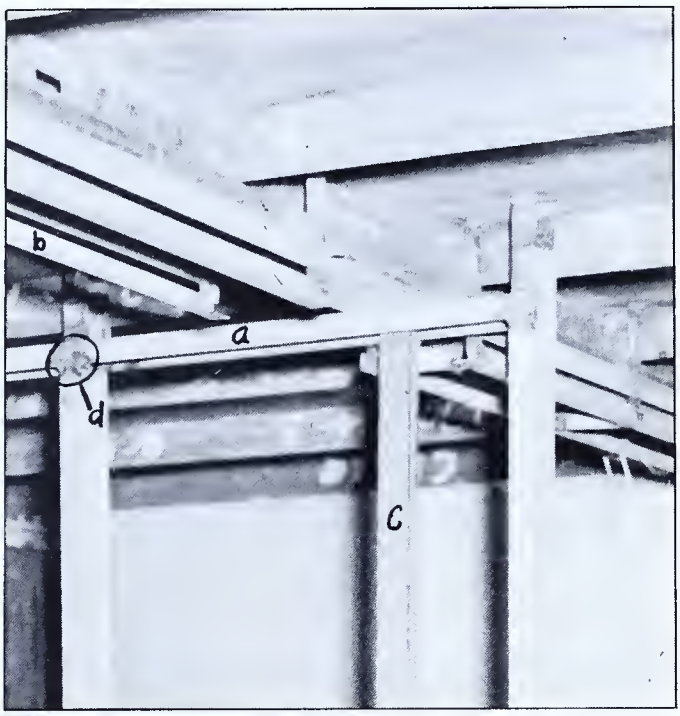


Fig. 78 — *Section Showing Intermediate Furring at "c"*

Procedure

1. Plumb up from the bottom to establish the line for the overhead furring.
2. Use chalk line or straight edge and soapstone to establish the overhead furring line.
3. Check the overhead furring line.
4. Determine which type of furring is required. See the drawing.
5. Cut the furring with the hack saw to the required length.
6. Have the pieces of furring welded in place, as shown at "d", Fig. 78.
7. Check the work for location and workmanship.

QUESTIONS

1. **Where is angle iron used as overhead furring?**
2. **What procedure is followed to get the line for the overhead furring?**
3. **How is the furring cut to length?**

JOB SHEET NO. 6
INSTALLING TOP AND BOTTOM SHELL SHOE

General Information

Shell iron is installed after the alignment of the house is definitely established. A welder is needed for the purpose of welding the iron in place.

The distance from the steel deck to the underneath part of the bottom shell shoe is shown in the drawing. It will be necessary to weld small pieces of common furring to the stiffeners, owing to their shape at the bottom. The ceiling is dropped as shown on the blueprint to clear all wires; it is necessary to drop the top shell shoe accordingly.

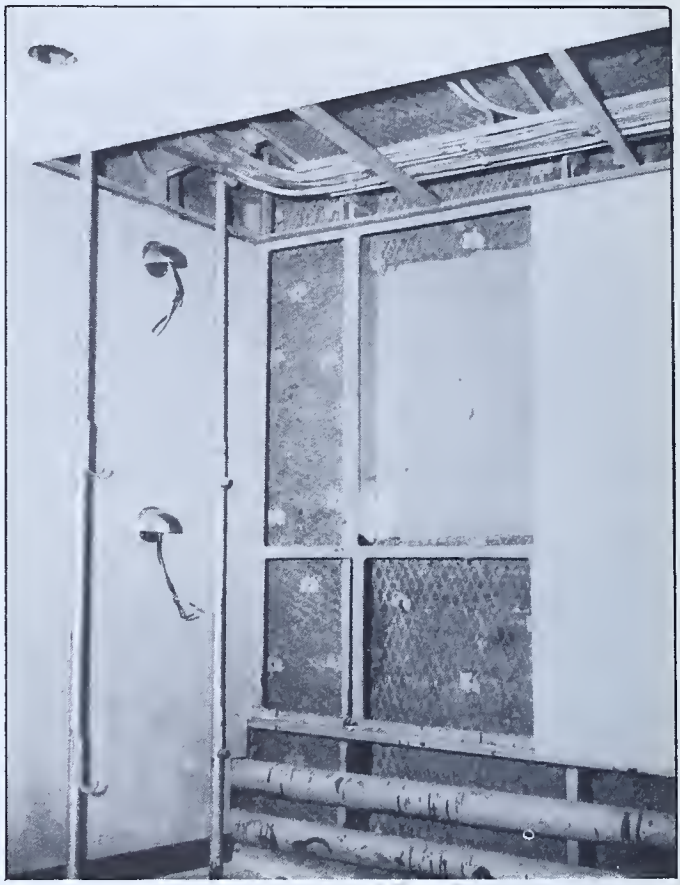


Fig. 79 — *Top Shell Shoe and Bottom Shell Shoe*

Materials

Bottom shell shoe according to the drawing detail. Top shell shoe according to the drawing detail.

Tools

1. 6′ Rule
2. Hack saw
3. Straight edge
4. Several C-clamps

Safety Suggestions

Stand on a saw horse, where necessary. Always avoid stepping backwards from a saw horse. Take care to avoid the flash of the welder's torch. Wear dark glasses.

PROCEDURE

1. Cut pieces of common furring to weld to the stiffeners.
2. Weld the furring in place.
3. Clamp the bottom shell shoe in place.
4. Check the job for straightness.
5. Weld the bottom shell shoe.
6. Clamp the top shell shoe in place.
7. Check the job for straightness.
8. Weld the top shell shoe in place.

FIG. 81 — *Close-up of Top Shell Shoe "T"*

FIG. 82 — *Close-up of Bottom Shell Shoe "B"*

QUESTIONS

1. **What are the names of the shell irons which are used for this job?**
2. **What purpose does each type of shell iron serve?**
3. **Why is it necessary to weld pieces of furring to the stiffeners?**
4. **Why should dark glasses be worn while working on this job?**

JOB SHEET NO. 7
INSTALLING INTERMEDIATE FURRING AND CEILING FURRING

General Information

When setting the panels in a room it is not possible to use panels which are all the same size. Panels are made in standard widths, (48″ wide) and because of room dimensions, it is not always possible to use full width panels. If panels are cut to fit certain room widths or lengths, the cutting and fitting is usually done around the sides, for ceiling, and around port light frames and doors, for the wall.

The blueprint shows the arrangement and sizes of the panels, and the spacing of the furring strips which form the base to which the panels are to be fastened. It will be noted from the blueprint that port lights and ventilators are centered wherever possible. The centering of these items improves the

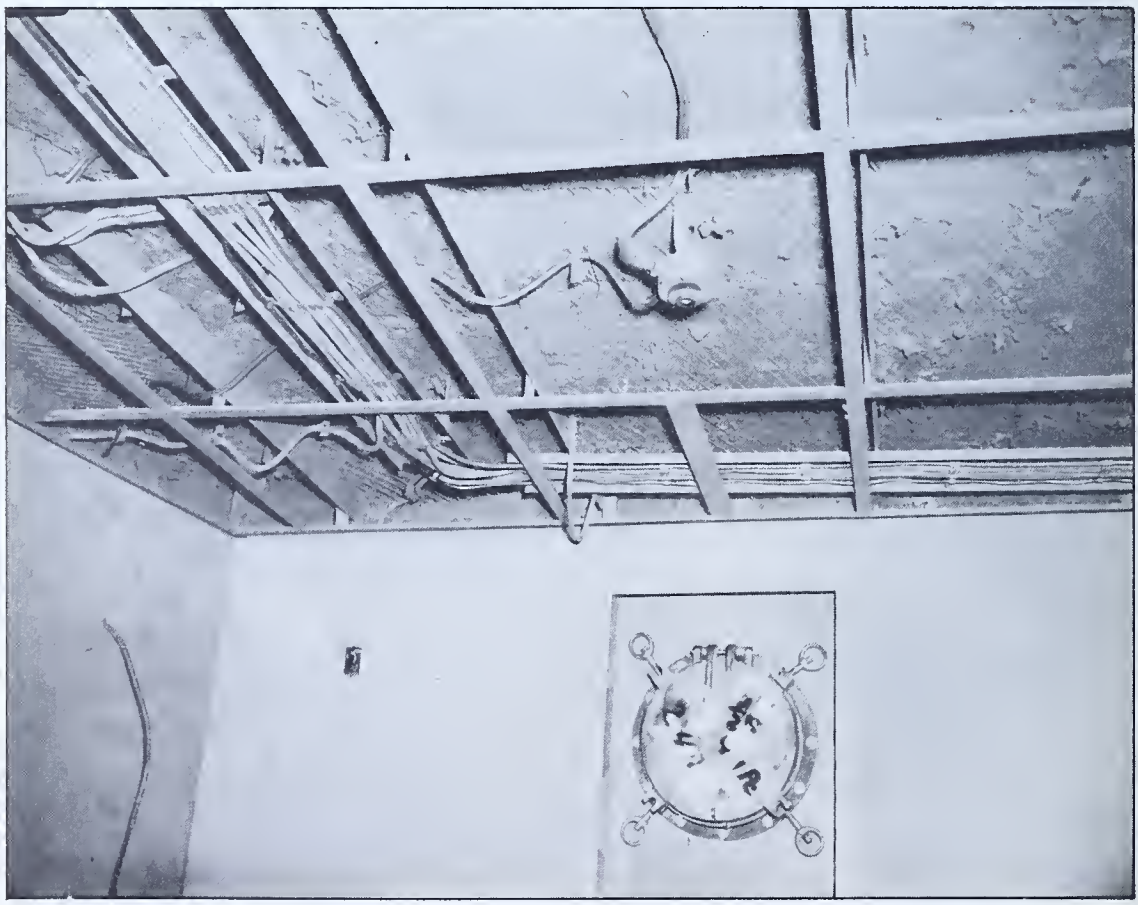


Fig. 83 — *Ceiling Furring*

appearance of the entire installation. See Fig. 83.

Ceiling and Shell Furring

The vertical shell furring strips are delivered with a clip welded on each end. These strips are bundled and tagged for the proper place. Using these strips will determine the proper height for the belt rail. This furring is spaced for the port light frames and panels. See Figs. 83 and 84.

Ceiling furring strips give the correct width for a full panel. From the blueprint it can be determined where the full panel is to be used.

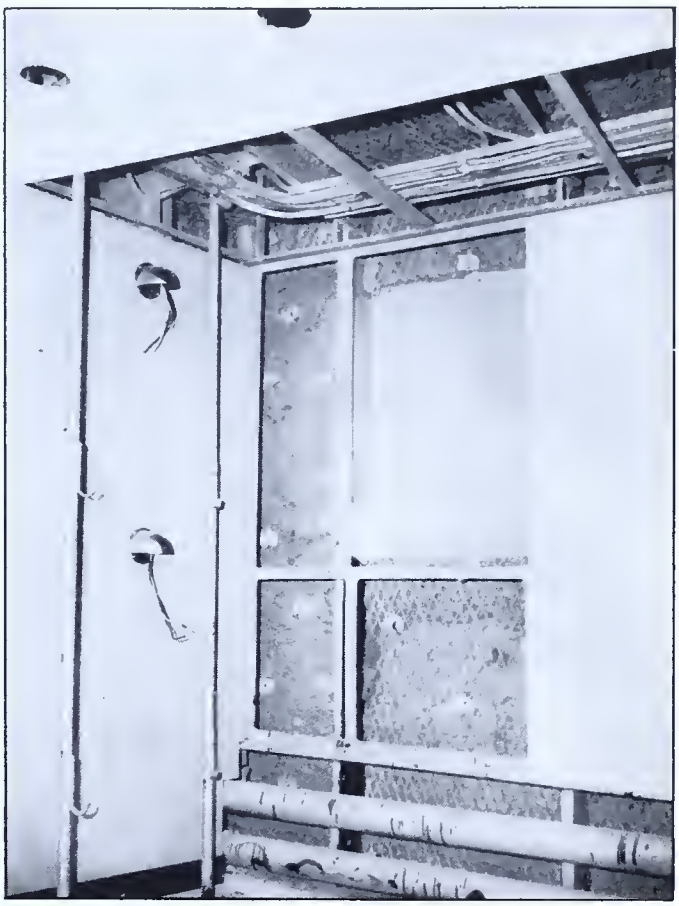


Fig. 84 — *Intermediate Shell Furring*

Materials

Common furring according to drawing detail. Special furring strips according to drawing detail.

Tools

1. 6′ Rule
2. Straight edge
3. Chalk line
4. Hammer
5. Several C-clamps

Safety Suggestions

Stand on a saw horse, when necessary. Avoid stepping backwards from a saw horse. Be careful to avoid the flash from the welder's torch.

Procedure

1. Determine which special strip is needed.
2. With a piece of special strip as a guide erect the horizontal shell furring.

3. Check the horizontal shell furring for position, and if correct weld in place.

4. Erect the vertical pieces of furring and clamp them in place at the top and bottom.

5. Check the distances between the vertical pieces of furring to find if the proper measurements have been made to take the port light frames and panels.

6. If the distance checks correctly, weld the vertical pieces of furring in place.

7. Follow the same procedure and install the ceiling furring.

NOTE: As previously stated the ceiling must be dropped according to the blueprint specifications.

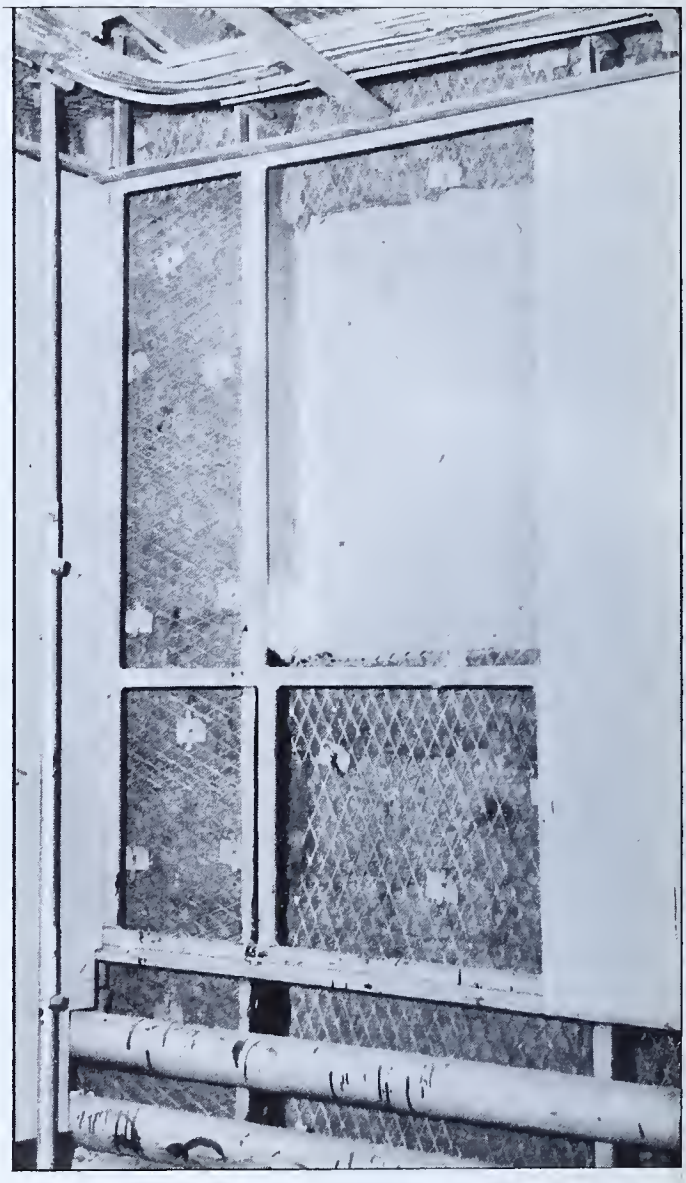


FIG. 85 — *A Close-up of Intermediate Shell Furring*

QUESTIONS

1. **How is ceiling furring installed?**
2. **What determines the height of the port light frames?**
3. **In what direction does the belt rail run?**

JOB SHEET NO. 8
SETTING INTERMEDIATE PANELS

General Information

Fig. 86 — *Intermediate Panels in Place*

Intermediate panels are made from a commercial material which is fireproof. The panels are metal clad on the surfaces. When cutting the panels to width a metal-cutting band saw is often used. At other times when special cutting must be done or when odd cuts must be made the cutting is done with a common hack saw.

Generally speaking, the intermediate panels are the first panels to be erected, thus giving the pipe fitter an opportunity to hang radiators, wash basins, etc. Some panels are ordered and are cut to size on the job; other panels are cut in the shop according to a specified width. It is necessary for identification purposes to mark these cut panels with the width and the location of the panel on board ship. A stock panel is 48″ wide and eight feet long. The panel is always cut to length and fitted on the job.

Material

Intermediate panels according to the drawing detail.
Proper size and type screws according to the drawing detail.

Tools

1. 6′ Rule
2. Hack saw
3. Claw hammer
4. Cold chisel
5. Bevel
6. Yankee screwdriver

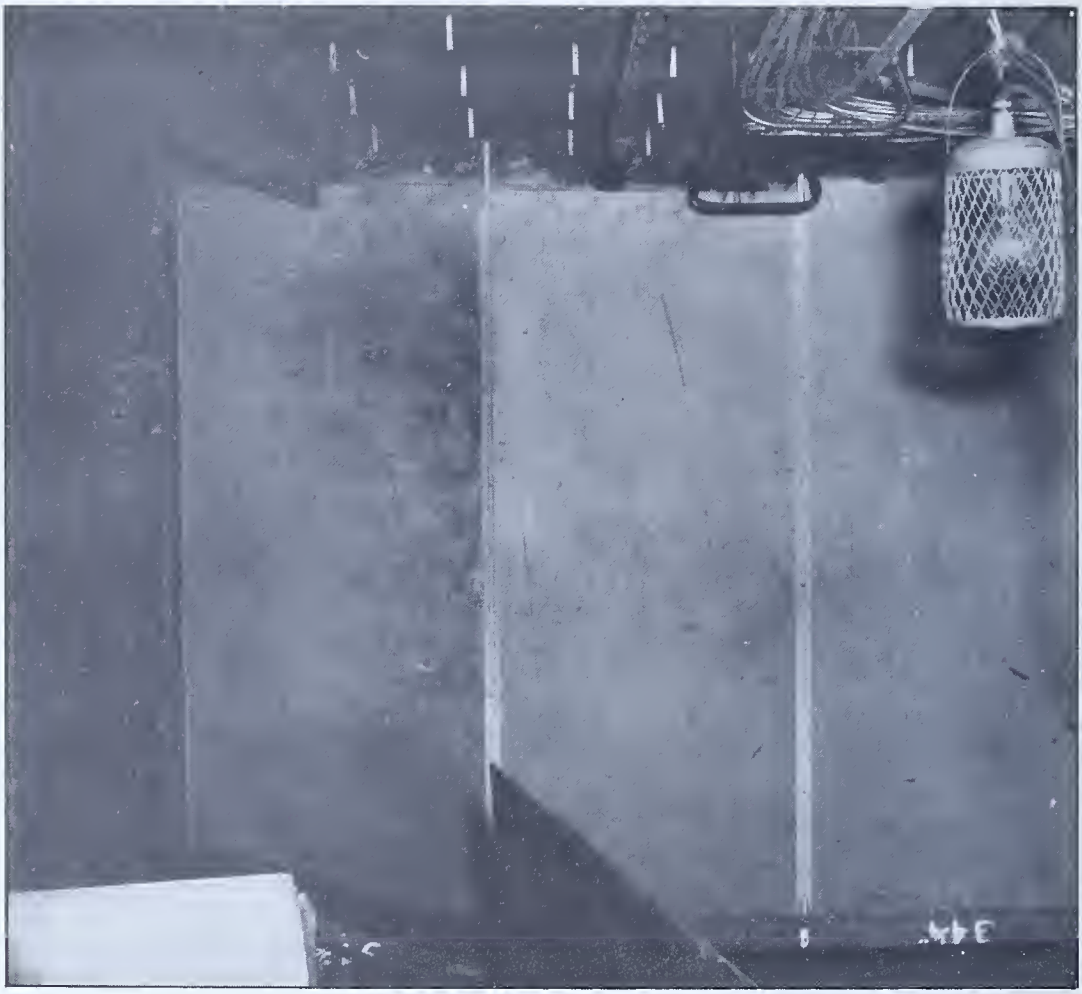


FIG. 87 — *Intermediate Panels With Pilaster Posts*

SAFETY SUGGESTIONS

Be cautious when handling tools. A saw horse is used to stand on when working at heights. Avoid stepping backwards from a saw horse. Be sure the panels are wedged securely before leaving the job.

PROCEDURE

1. Select the correct panel for the room in which the work is being done.
2. Check the width of the panel with the blueprint and the opening.

   NOTE: The width of the panel must be correct for the opening into which the panel is to be fitted.
3. Cut the panel to the proper height and bevel according to the extent of camber or sheer.

4. Cut out for any pipe or obstacles that may be in the way of the panel when it is erected.
5. Red lead all cut edges and check all other edges to be sure they are metal clad.
6. Set the panel in place and secure it in position temporarily by wedging it with wooden blocks at the top of the panel.
7. Have the driller drill the correct size holes for securing the panels in place.
8. Screw panels in place using the specified size screws. See drawing detail.

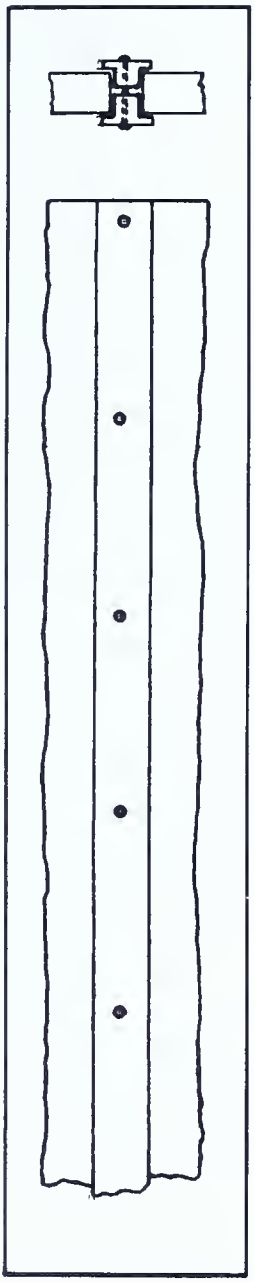


FIG. 88 — *Pilaster Post in Place*

QUESTIONS

1. **Why are the panels set temporarily at first?**
2. **What are the two distinguishing features of an intermediate panel?**
3. **What size and type of screw is used to fasten the intermediate panels?**
4. **What size hole is drilled for the screw in question No. 3?**

JOB SHEET NO. 9
SETTING METAL DOORFRAMES AND DOORS

General Information

The metal doors are received already hung in the metal frames, and are stamped on the upper hinge for the opening in which they are intended to be installed. To locate the position of the door on the ship it is necessary to refer to the blueprint. For example: A door stamped No. 15 may be the one leading from the captain's office to the captain's state room, as shown in the print. It is good practice to set the frames when setting the panels, since this will eliminate taking the panels down.

Tools

1. 6′ Rule
2. Hack saw
3. Claw hammer
4. Cold chisel
5. Automatic screwdriver

Materials

Metal door frame and door according to drawing detail.

Proper size and type screws according to drawing detail.

Procedure

1. Select the proper door frame and door for the opening. See the blueprint.
2. Remove door from frame by removing the loose pins in the hinges.
3. Set frame in the opening.

Fig. 89 — *Metal Door Frame and Combination Door*

4. Check the frame for correct height from steel deck to door sill.

   NOTE: It may be necessary to cut the bottom of the frame to obtain the correct height.

5. Adjust the door frame and wedge it in place at the proper height.

   NOTE: It may be necessary to cut the bottom of the frame to obtain the correct height.

6. Have driller drill the correct size holes for securing frame in place.

7. Secure frame in place with proper size screw. See drawing detail.

8. Rehang the door in frame, checking to make sure it is straight and true with the frame. See Fig. 89.

QUESTIONS

1. **How can the proper frame and door be identified for the opening in question?**
2. **What sizes and types of screws are used to fasten the door frames in place?**
3. **What size hole is drilled for this screw?**

JOB SHEET NO. 10
SETTING SHELL PANELS

General Information

Shell panels are made of the same kind of material from which the intermediate panels are made. Shell panels are metal clad on one surface. The sizes of the shell panels are determined by the locations of the air ports already cut in the side of the shell. The panels are arranged to give the room a well balanced appearance. The panel below the port light is so installed that it can be removed in order to inspect the ship's structure. Panels are fastened to the furring with self tapping screws of an approved type.

These panels are installed only after mechanics, such as electricians, pipe fitters, and others, have completed their work at this section of the ship.

Tools

1. 6′ Rule
2. Hack saw frame
3. Claw hammer
4. Cold chisel
5. Bevel
6. Automatic screwdriver

Materials

Shell panels according to drawing detail.

Proper sizes and types of screws according to drawing detail.

Procedure

1. Select the proper panel for the room in which the work is being done.

   Note: These panels are marked for size and the room for which they are intended.

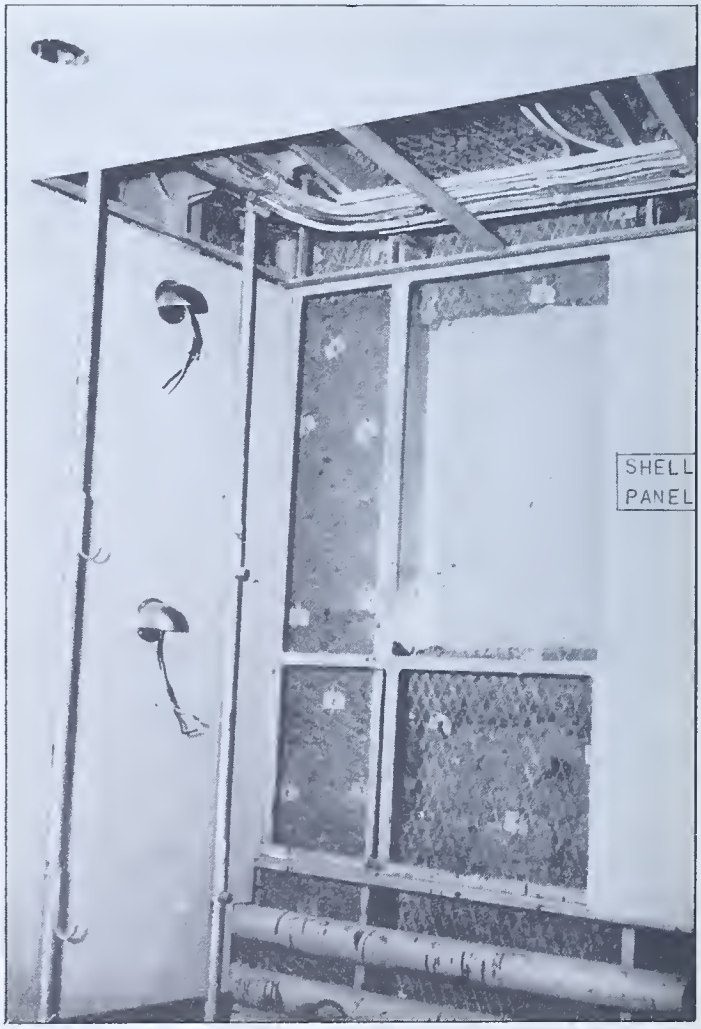


Fig. 90 — *Shell Panel in Place*

2. Check the width.
3. Cut the panel to the proper height and bevel according to the amount of camber or sheer.
4. Cut the panel for any pipes or obstacles which may be in the way of the panel when it is erected.
5. See that all edges are metal clad, or red leaded.
6. Set in place and wedge with wooden blocks.
7. Have the driller drill the proper size holes to secure the panels in place.
8. Screw panels in place using the proper size screws. See blueprint.

QUESTIONS

1. **What are two distinguishing features of the shell panel?**
2. **What size and type of screws are used to fasten the shell panels in place?**
3. **What size holes are drilled for this screw?**
4. **Why should other crafts be cleared before erecting shell panels?**

JOB SHEET NO. 11
SETTING PORT LIGHT FRAMES

General Information

Metal port light frames, or boxes as they are called, are received already assembled. They are beveled as may be required to suit the camber and sheer of the ship. Port light frames carry a code number on the frame. The code number is shown on the blueprint at the correct location; the correct frame, therefore, can be determined, for a particular port light, by referring to these code numbers.

A scribing strip is put around the inside of the frame to make it water tight. This strip is coated on the under side with water proof compound, and then screwed in place.

Tools

1. 6′ rule
2. Hack saw
3. Automatic screwdriver

Materials

Port Light Frame according to the drawing detail.

Scribing strip according to the drawing detail.

Proper size and type of screws according to the drawing detail.

Equipment

Saw horse

Portable electric grinder

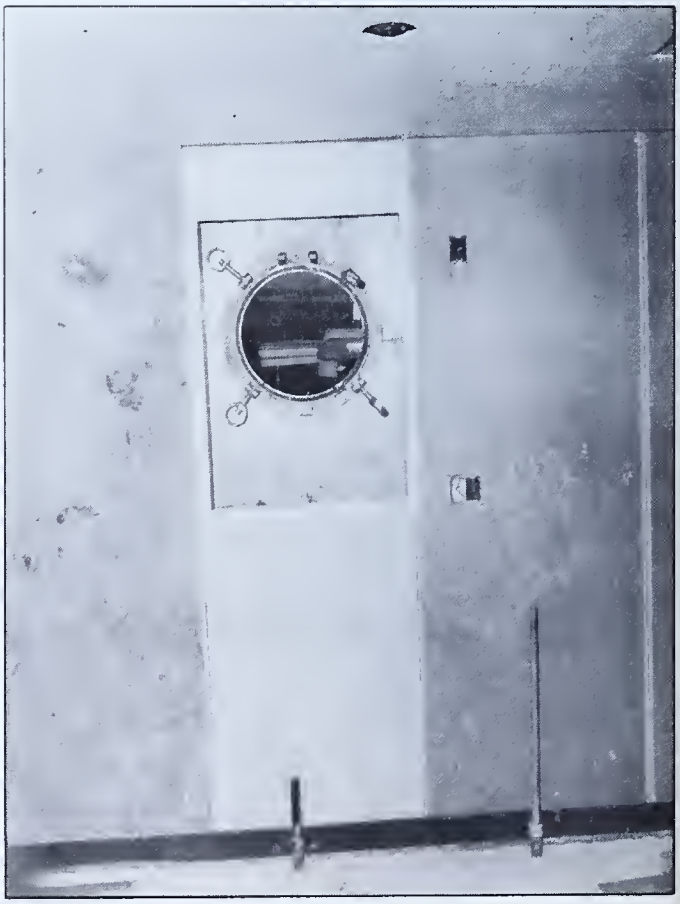


Fig. 91 — *Port Light Frame in Position*

Procedure

1. Select the proper port light frame. See drawing detail.

2. Set the frame in position against the shell so that the port hole will be centered in the frame. See Fig. 91.
3. Have driller drill proper size holes to fasten the frame.
4. Fasten the frame in place with proper size screws.
5. Scribe the strip according to the outline of the shell at the frame.
6. Remove the strip from the frame and grind it to the scribed line, using a portable grinder.
7. Have driller drill proper size holes to fasten the strip.
8. Coat the under side of the strip with water proofing compound.
9. Secure the strip in place using the proper screws.

QUESTIONS

1. **Why are scribing strips inserted in the port light frames?**
2. **What size and type screws are used to fasten the port light frames in place?**
3. **What size and type of screws are used to fasten the scribing strips in place?**
4. **Why are the scribing strips coated on the under side with a water proof coating?**

JOB SHEET NO. 12
ERECTING CEILING PANELS

General Information

Ceiling panels are of an approved fireproof nature, but are not metal clad. The ceiling panels are layed out in a manner which allows the lights and ventilators to center in correct proportion. Correctly centered and proportioned panels give the room a well-balanced appearance. The panels are fastened to the furring with a self tapping screw of an approved type. These panels are installed only after mechanics, such as electricians, pipe fitters, sheetmetal men and others, have completed their work at this section.

Tools

1. 6′ Rule
2. Hack saw
3. Claw hammer
4. Cold chisel
5. Bevel
6. Automatic screwdriver

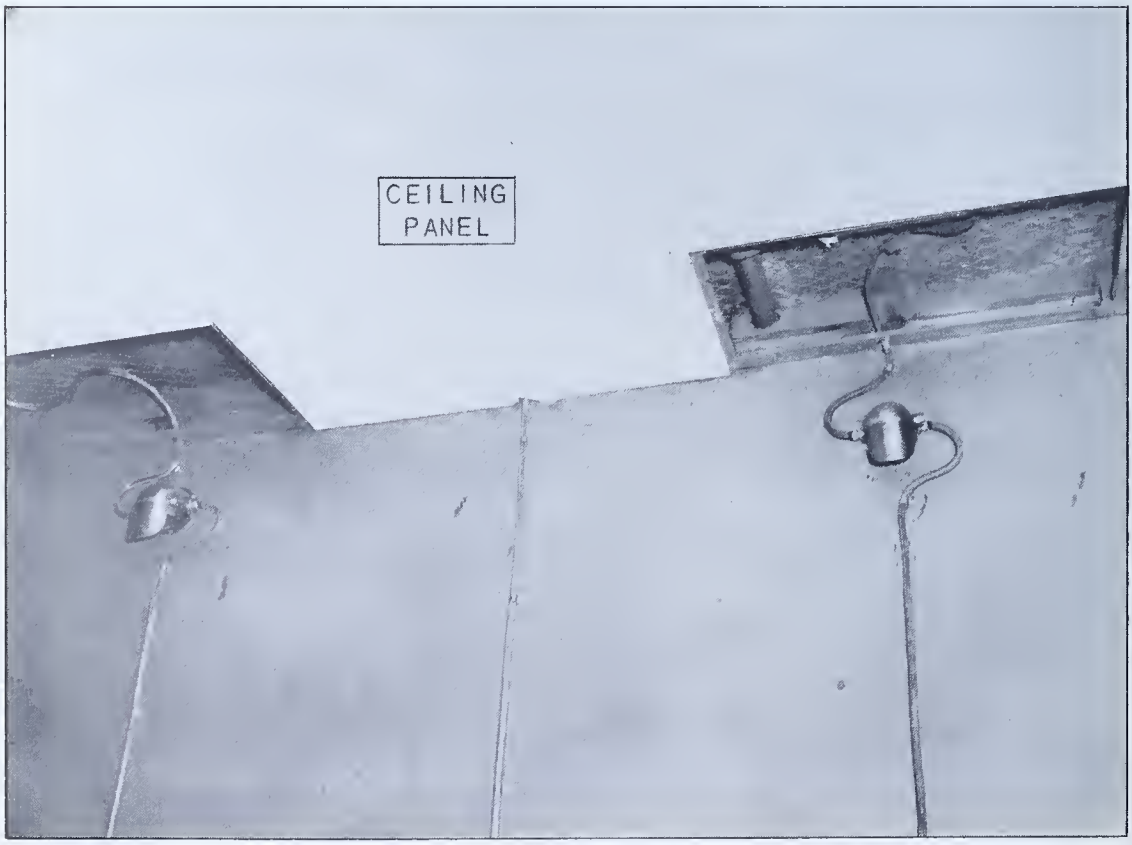


Fig. 92 — *Ceiling Panels in Place*

Materials

Ceiling panels according to drawing detail.

Proper type and size of screws according to drawing detail.

PROCEDURE

1. Determine the location of the full panel. Refer to the drawing for location.
2. Place the full panel in position. See Fig. 92.
3. Cut pieces of panels to fill the remainder of the ceiling.
4. Place remaining pieces in position.
5. Have driller drill proper size holes to fasten panels in place.
6. Screw panels in place using proper size and type of screws. See drawing detail.

QUESTIONS

1. **Are ceilings laid out for panels before erecting them? Why?**
2. **What is taken into consideration in laying out ceilings? Why?**
3. **What size and type of screw is used to fasten ceiling panels into place?**

JOB SHEET NO. 13
SETTING AND TRIMMING STAIRS

General Information

The stairs are delivered in one unit (stringers, treads and risers). The setting of the stairs is one of the first operations undertaken, consideration being given to safety and to making accessibility from one deck to another less difficult. The services of a burner and a welder will be needed on this operation.

Tools

Complete set of personal tools.

Material

Set of stairs as shown in the drawing detail.

Stair trim as shown in the drawing detail.

Linoleum stair tread as shown in the drawing detail.

Stair nosing as shown in the drawing detail.

Fig. 93 — *Stairs Trimmed, Showing Metal Hand Rail, Newel Post and Cap, and Balustrade*

Safety Suggestions

Be careful to avoid falling into openings between decks. Make sure there are enough men to lift the stairs without strain. Be careful to avoid flash from welder's torch.

Procedure

1. Check the opening in the deck for the proper size and location.
2. Set the stairs in place.
3. Line-up stairs, obtaining proper distance, as specified on stairs' drawing detail.

4. Have the welder tack the stairs in place.
5. Check the work for accuracy and workmanship.
6. Have the welder weld the stairs firmly in place.
7. When other operations, such as divisional bulkheads and doors, have advanced sufficiently, trim out the stairs as specified in stair drawing detail. See Fig. 94.

NOTE: Linoleum treads are not applied until the boat is nearly completed.

FIG. 94 — *Stairs Trimmed Showing Trim and Stair Nosing*

QUESTIONS

1. **Why are the steps set as one of the first operations?**
2. **Why are the linoleum treads not put on until the ship is nearly completed?**
3. **Why is it important to check the opening in the deck before setting the stairs?**

JOB SHEET NO. 14
INSTALLING INSULATION AND FINISHING AMMUNITION LOCKERS

General Information

From the plan, determine the location of the ammunition lockers, and the bulkheads to be insulated. The services of a welder will be required to weld the insulation pins and the furring hangers in place.

Tools

1. Hack saw blade
2. 6′ Rule
3. Pair of cutting pliers
4. Claw hammer
5. Hand saw
6. Automatic screwdriver

Materials

Approved insulation. See Job Sheet No. 3.
Approved panels according to the drawing detail.
Furring according to the drawing detail.
Proper size and type of screws according to the drawing detail.

Supplies

Novelty shears Saw horse
Air drill

Safety Suggestions

1. Be careful when going up and down a ladder.
2. When lowering panels and other heavy material be sure that they are securely tied and that no one is under the load.
3. Be certain that the safety department has inspected and passed the ammunition chamber before entering to work. An accumulation of gasses in this small compartment may be extremely dangerous.

Procedure

1. Erect the furring according to the plan.
2. Insulate. See Job Sheet No. 3, "Installation of Insulation".
3. Cut panels to size.
4. Install the panels in the proper location.
5. Have driller drill proper size holes for screws.
6. Fasten panels in place, using proper size and type of screws, as specified on screw detail.

QUESTIONS

1. Where are the ammunition lockers located on the ship on which the work is being done?
2. How is access to these lockers gained?
3. Why must permission be secured from the Safety Department before the mechanic may enter ammunition lockers to work?

JOB SHEET NO. 15
INSULATING AND FINISHING AN ICEBOX

General Information

The ship's icebox is insulated with approved insulating material according to the ship's icebox drawing detail. The services of a welder will be needed to weld spikes and hangers to the bulkhead.

The refrigerator doors and door frames are received already assembled. Be sure that other mechanics have completed their work before going ahead with this job. Figure 96 shows the inside of a refrigerated cargo hold before insulation is installed.

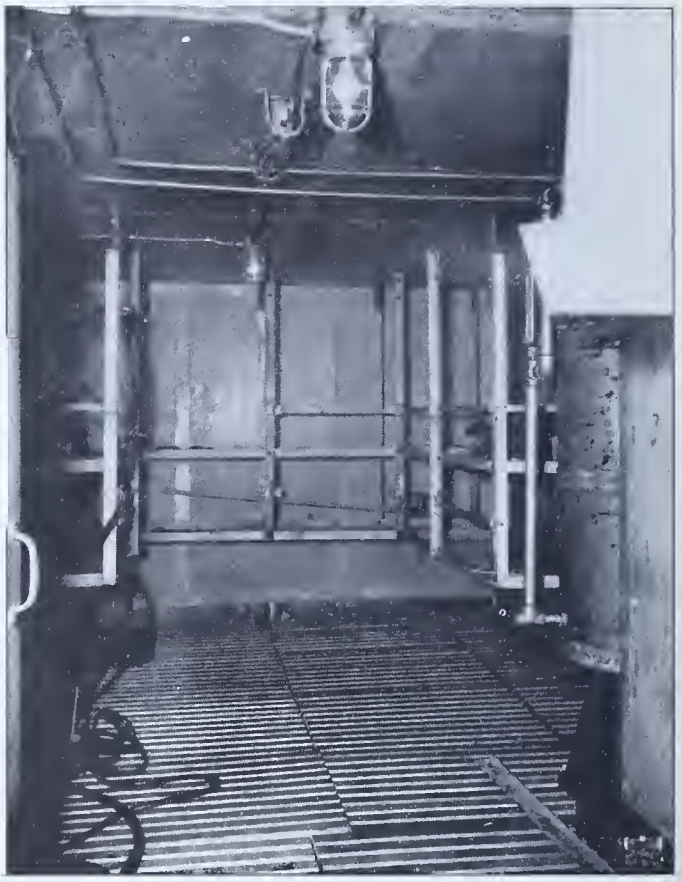


Fig. 95 — *Interior of the Ship's Icebox*

Tools

1. 6′ Rule
2. Claw hammer
3. Hand saw
4. Chalk line
5. Adjustable wrench

Material

Approved finishing material as specified on icebox detail.
Refrigerator doors and frames as per detail.

Safety Suggestions

Work safely.

Avoid injuries from spikes.

PROCEDURE

1. Have welder weld insulation spikes and angle iron to steel bulkhead. The insulation spikes are for the purpose of holding the insulation in place.
2. Erect furring according to the plan.

   Angle irons are used as a means of fastening the furring.
3. Install insulation of approved type, according to icebox detail in the following order:
   (a) Floor
   (b) Sidewalls
   (c) Ceiling

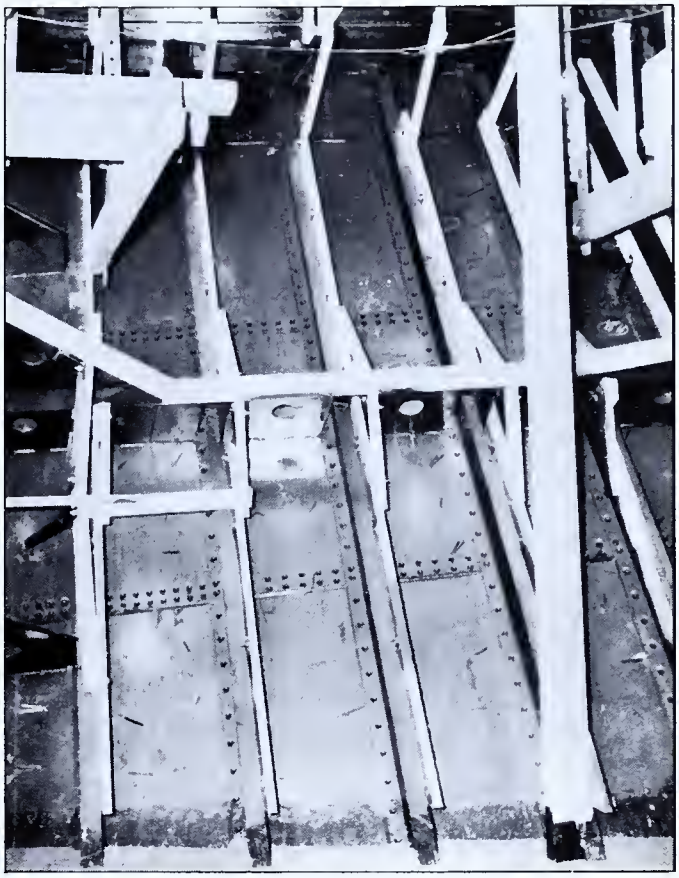


FIG. 96 — *Insulation Pins Welded to Shell in a Cargo Hold*

4. Set refrigerator door frames; check for squareness and alignment.
5. Finish inside of icebox according to drawing details.

   Plywood, lead sheathing, corkboard, or sheet metal may be specified.
6. Hang doors and check for proper alignment.
7. Install grating of approved type, as specified.

QUESTIONS

1. **Where is the ship's icebox located on the ship on which you are working?**
2. **What purpose does the ship's icebox serve?**
3. **What part of the ship's icebox is insulated?**
4. **List materials used in constructing the icebox on the ship on which you are working.**

FIG. 97 — *Finished Refrigerated Cargo Hold*

FIG. 98 — *Insulation Built Around Corrugations and Gussets in a Refrigerated Cargo Hold*

JOB SHEET NO. 16
TRIMMING OUT ROOMS AND PASSAGEWAYS

General Information

Trim is installed in a room primarily to cover different fastenings, and also to give the room an attractive finished appearance. To accomplish this it is important to balance the spacing of pilasters in relation to lights, ventilators, cutouts, etc. The trim mentioned here features a hidden screw, commonly called "screwless trim". The trim in a room or passageway consists of many different members, all especially named. However, there are six general headings under which trim may be listed, including top molding, base molding, ceiling strip, pilaster strips, inside corner strip and outside corners. Each of the above-mentioned kinds of molding has several parts or members. All trim is of an approved fireproof type.

Fig. 99 — *A Finished State Room*

Material

Top molding according to drawing detail.
Base molding according to drawing detail.
Ceiling strips according to drawing detail.
Pilaster strips according to drawing detail.
Inside corners according to drawing detail.
Outside corners according to drawing detail.
Proper type and size screws according to drawing detail.

FIG. 100 — *An Office, Trimmed Out*

Tools

1. 6′ rule
2. Hack saw frame
3. Automatic screwdriver
4. Claw hammer
5. File with handle

SAFETY SUGGESTIONS

Work safely.

Use a file with a correctly fitted handle.

PROCEDURE

1. Select the proper top molding with its members.
2. Cut the molding to the correct length. (Measure job location.)
3. Install molding according to instructions.

Repeat the above operations for each type of trim installed.

FIG. 101 — *A Finished Section of a Wheelhouse*

QUESTIONS

1. **Why are rooms and passageways trimmed?**
2. **What are the six general headings under which trim is listed?**
3. **What members make up the complete trim under each heading?**
4. **How is each member installed?**

JOB SHEET NO. 17
TRIMMING OUT BATHROOMS

General Information

Bathroom trim is of an approved fireproof type. There are several different kinds of bathroom trim, each with a particular name, and each used in a particular place. All bathroom trim is set with gaskets in a water proofing compound, as shown on the bathroom drawing detail.

Tools

1. 6′ rule
2. Hack saw frame
3. Automatic screwdriver
4. Square
5. Putty knife

Material

Bathroom trim according to drawing detail.

Waterproofing material according to drawing detail.

Proper type and size of screws according to drawing detail.

Procedure

1. Select proper trim as per detail.
2. Cut trim to proper length.
3. Install trim.

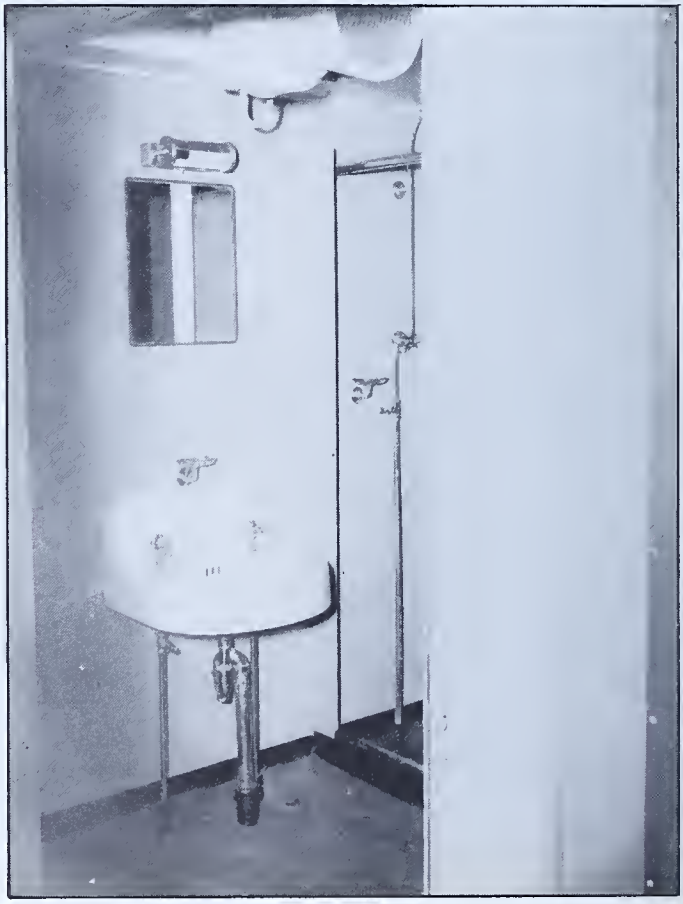


Fig. 102 — *Portion of a Finished Bathroom*

QUESTIONS

1. **What different kinds of bathroom trim are used?**
2. **What is the special use of each kind of trim?**
3. **Why is bathroom trim set with gaskets and a waterproofing compound?**
4. **What type and size of screws are used to fasten bathroom trim in place?**

JOB SHEET NO. 18
SETTING SETTEES

General Information

Settees are pieces of furniture found for the most part in the officers' quarters. They consist of a metal frame, a wooden seat board, and a wooden back board. After the boards are properly fitted, they are sent to the shop to be upholstered. The upholstered seats and backs are among the last items to be placed on board. The settees are marked according to the room for which they are intended.

Material

One settee according to the drawing detail.

Tools

1. 6′ rule
2. Hack saw frame
3. Hand saw
4. Jack plane
5. Automatic screwdriver

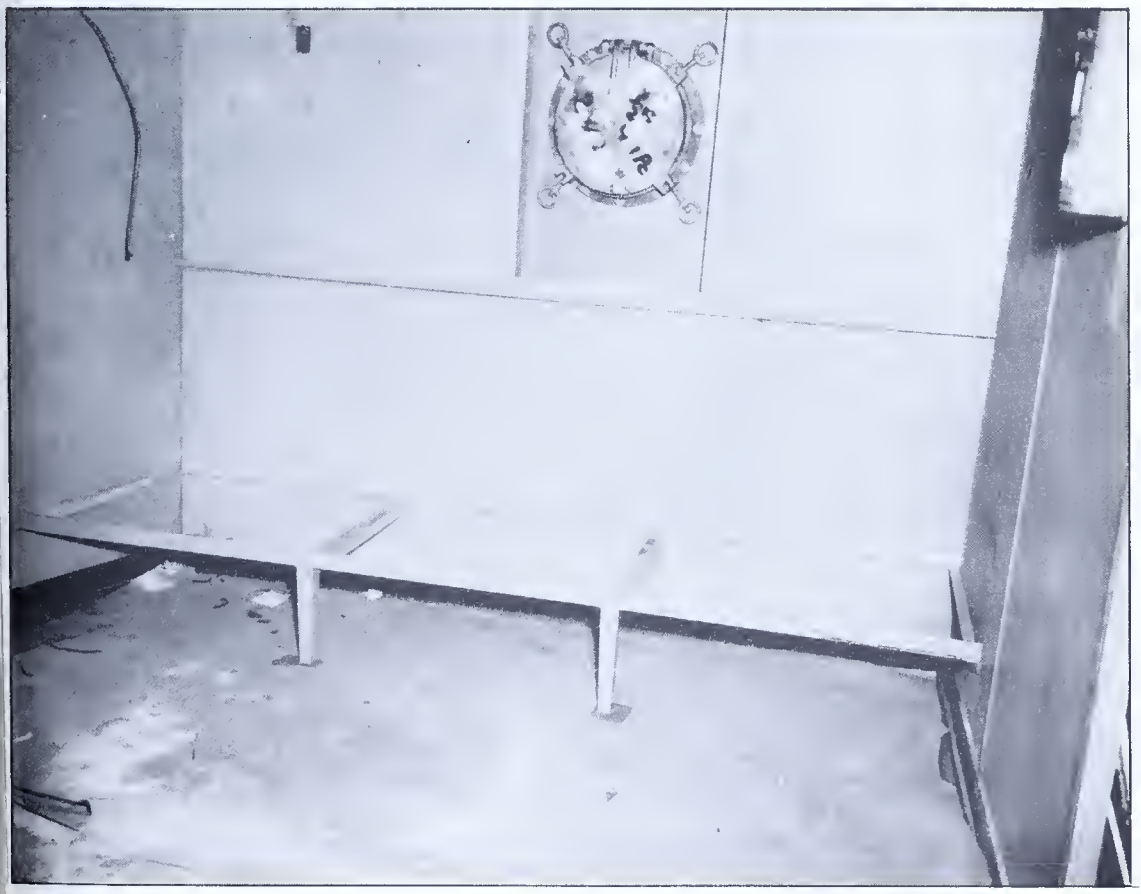


Fig. 103 — *A Settee Frame in Place*

FIG. 104 — *Finished Settee*

PROCEDURE

1. Select the specified settee for the room where the settee is to be installed.
2. Locate the settee in the room according to plan drawing.
3. Set the frame, to the proper height, as shown on the drawing detail.
4. Fit and install seat board and back board.
5. Remove seat board and back board to be upholstered. Be sure seat board and back board are marked so that they can be identified.
6. Identify each seat board by labeling according to the room for which it has been fitted.

QUESTIONS

1. **Where are the settees usually located on a ship?**
2. **Who upholsters the settees?**
3. **Why must the seat board and the back board be marked with similar symbols?**

JOB SHEET NO. 19
SETTING METAL FLAT TOP PEDESTAL DESKS

General Information

From the plan drawing the rooms in which flat top desks are to be placed may be determined. These desks are crated and marked for the room for which they are intended. Desks are delivered to the job, assembled, not knocked down.

Tools

1. Hack saw frame
2. 6′ rule
3. Automatic screwdriver
4. Claw hammer

Material

Flat top pedestal desk as specified on drawing detail.

Safety Suggestions

Avoid injuries from tools and materials.

When uncrating furniture avoid injuries from nails. Do not leave any nails sticking up in the boards.

Fig. 105 — *A Flat-top Desk in Place*

PROCEDURE

1. Determine from the marking on the crate where the desk is to be placed. Check this according to the plan.
2. Uncrate the desk. *Caution* — Avoid damaging the desk by scratching or bumping.

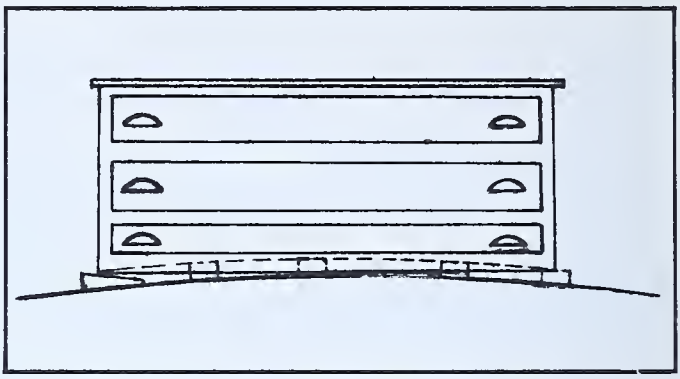


FIG. 106 — *Scribing a Desk to the Deck*

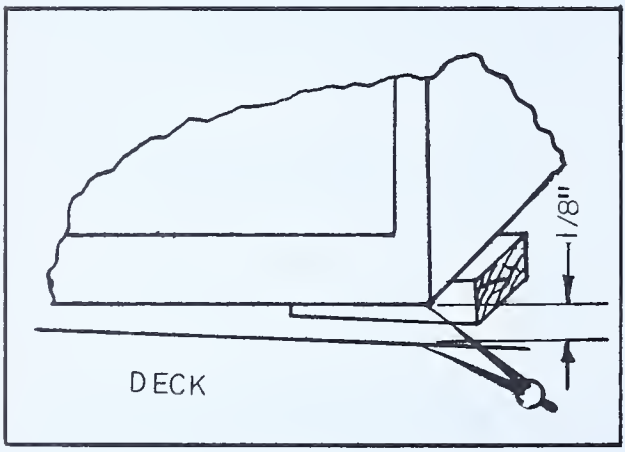


FIG. 107 — *Wedge Under Base to Level the Desk*

3. Remove the drawers, being sure to mark the drawers according to their respective positions.
4. Remove keys from desk. See that they are marked properly, and then turn them over to the leader.
5. Determine from the plan the location of the desk in the room.
6. Set desk and scribe to deck. See Fig. 106.

NOTE: Figure 106 shows a desk wedged level on the deck. The opening at the end of the desk base between the deck and the base usually is about ⅛". (Fig. 106) — Scribing a Desk to the Deck. See Fig. 107. With the desk leveled on wedges use a pair of dividers as shown in Fig. 108, scribing a line across the front of the desk base. The dividers must be held in the manner shown in the figure. This position must be maintained for the entire scribing distance across the front of the base to ensure a fit.

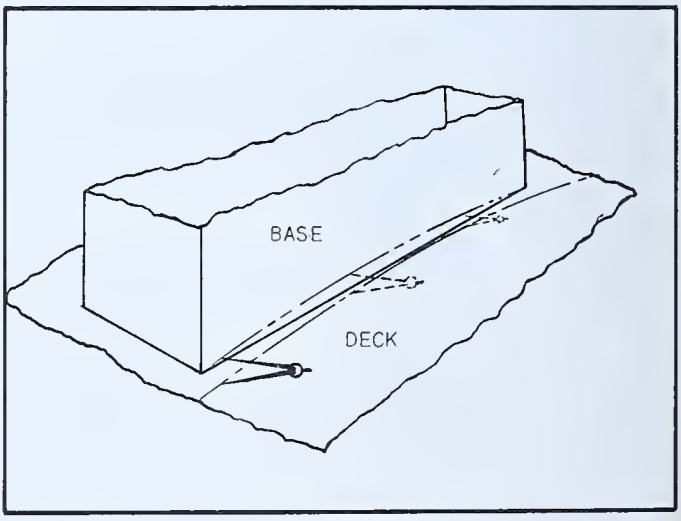


FIG. 108 — *Scribing to Deck With Dividers*

A block may be used instead of the dividers as shown in Fig. 106. The block is moved along the deck and a scriber is used to mark the base as shown by the broken line in the sketch.

7. Cut desk to scribe line with hacksaw, if necessary.
8. Fasten desk in place using proper size and type screws.
9. Replace drawers in their proper order.

QUESTIONS

1. **In what rooms are flat top desks installed?**
2. **Why is it necessary to properly tag the keys?**
3. **What safety precaution applies particularly to this job?**

JOB SHEET NO. 20
SETTING A METAL CHIFFONIER DESK

General Information

From the detail it can be determined in which rooms chiffonier desks are to be placed. These chiffonier desks are crated and marked for the room for which they are intended. They are assembled ready to be installed after fitting to the deck.

Tools

1. Hack saw frames
2. 6′ rule
3. Automatic screwdriver
4. Claw hammer

Material

Chiffonier desk according to drawing detail.

Fig. 109 — *A Chiffonier Desk in Place*

Safety Suggestions

When uncrating, avoid injuries to the piece from nails. Do not leave nails sticking up in boards.

Procedure

1. Determine from the marking on the crate in what room the desk is to be installed. Check this carefully.
2. Uncrate the chiffonier desk.
3. Remove the drawers, being sure to mark the drawers so they can easily be identified.
4. Remove keys from desk. See that they are properly marked, and then give them to the leader.
5. Determine from the plan the location of the desk in the room.
6. Set the desk and scribe to the deck.
7. If necessary, cut to scribe line with hack saw.
8. Fasten desk in place using proper screws, according to the drawing detail.
9. Replace drawers in their proper order.

QUESTIONS

1. **In what rooms are the chiffonier desks installed?**
2. **Why is it necessary to tag the keys properly?**
3. **What safety precaution applies particularly to this job?**

JOB SHEET NO. 21
SETTING A METAL CHEST OF DRAWERS

General Information

From the detail the rooms which are to be equipped with a chest of drawers can be determined. These chests of drawers are crated and marked for the room for which they are intended. The chests of drawers are received assembled, not knocked down.

Tools

1. Hack saw frames
2. 6′ Rule
3. Automatic screwdriver
4. Claw hammer

Material

Metal chest of drawers according to drawing detail.

Fig. 110 — *Chest of Drawers in Place*

Safety Suggestions

When uncrating, avoid injuries from nails; do not leave nails sticking up in boards.

Procedure

1. Determine from the marking on the crate where the chest of drawers is to be installed. Check this carefully.
2. Uncrate the chest of drawers.
3. Remove the drawers; be sure to mark them so they may easily be identified.
4. Remove the keys from the chest of drawers; see that they are marked properly and then give them to the leader.
5. Determine from the plan the location of the chest of drawers in the room.
6. Set the chest of drawers in place, and scribe to deck.
7. If necessary cut to scribe line with hack saw.
8. Fasten chest of drawers to the deck, using the proper screws as shown on the drawing.
9. Replace drawers in proper order.

QUESTIONS

1. **In what rooms are chests of drawers installed?**
2. **Why is it necessary to tag the keys properly?**
3. **What safety precaution applies particularly to this job?**

JOB SHEET NO. 22
TRIMMING OUT WARDROBES

General Information

Wardrobe trim is of an approved fire proof type, and is used to give the wardrobe a finished appearance by covering other fastenings. The base molding is the same as is used in the rooms. The corners and top molding are different. See wardrobe detail.

Materials

Base molding according to drawing detail.
Inside corner molding according to drawing detail.
Top molding according to drawing detail.
Proper type and size of screws according to drawing detail.

Procedure

1. Select the proper base molding with its members.
2. Cut to proper length.
3. Install trim.

Repeat the above operations for each type of molding installed.

QUESTIONS

1. **Why are wardrobes trimmed?**
2. **What is the name of each "member" of trim used in a wardrobe?**
3. **What is the use of each trim member?**
4. **What types and sizes of screws are used in trimming out a wardrobe?**

JOB SHEET NO. 23
INSTALLING HARDWARE

General Information

Under the heading of hardware are listed such items as hooks and bumpers, ajar hooks, coat hooks, coat rods, etc. From the bill of material may be obtained a list of the hardware needed for each ship. The drawing details will give the location of each item.

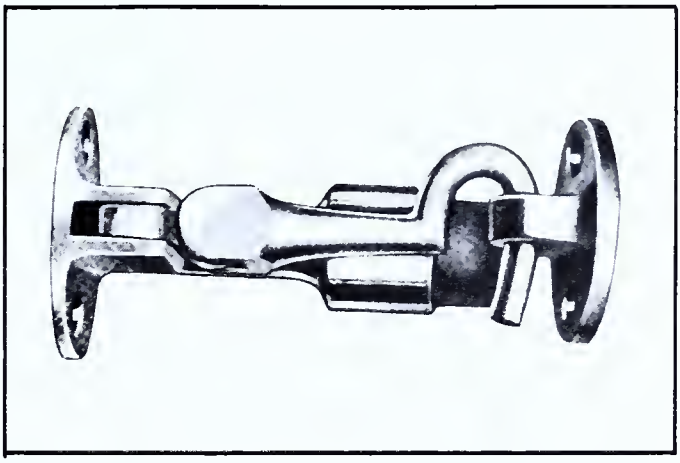


Fig. 111 — *Combination Hook and Bumper*

Material

Hardware according to drawing detail.

Tools

1. 6′ rule
2. Hammer
3. Center punch
4. Automatic screwdriver
5. Air drill
6. Drills

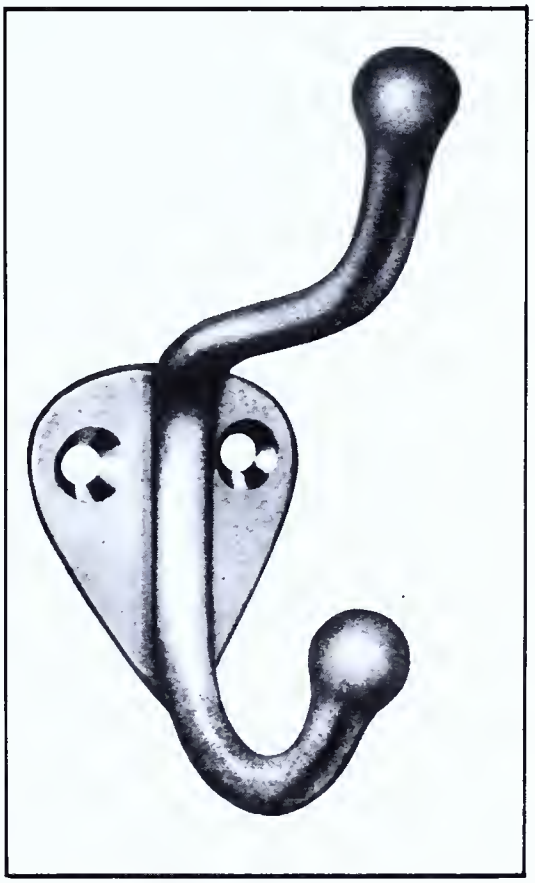


Fig. 112 — *Coat Hook*

Procedure

1. Select the hardware to be installed.
2. Locate hardware in room, according to drawing details.
3. Drill proper size holes for screws.
4. Secure hardware in place, using proper size and type screws.

QUESTIONS

1. What hardware is necessary for each room on the ship?
2. What type and size of screws are used for each type of hardware listed?
3. What is the purpose of each type of hardware listed?

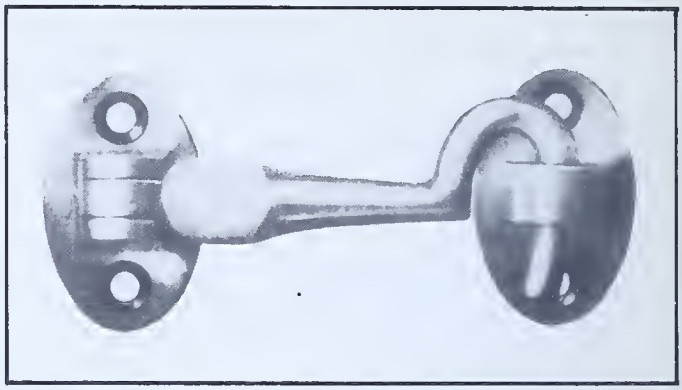


FIG. 113 — *3″ Ajar Hook*

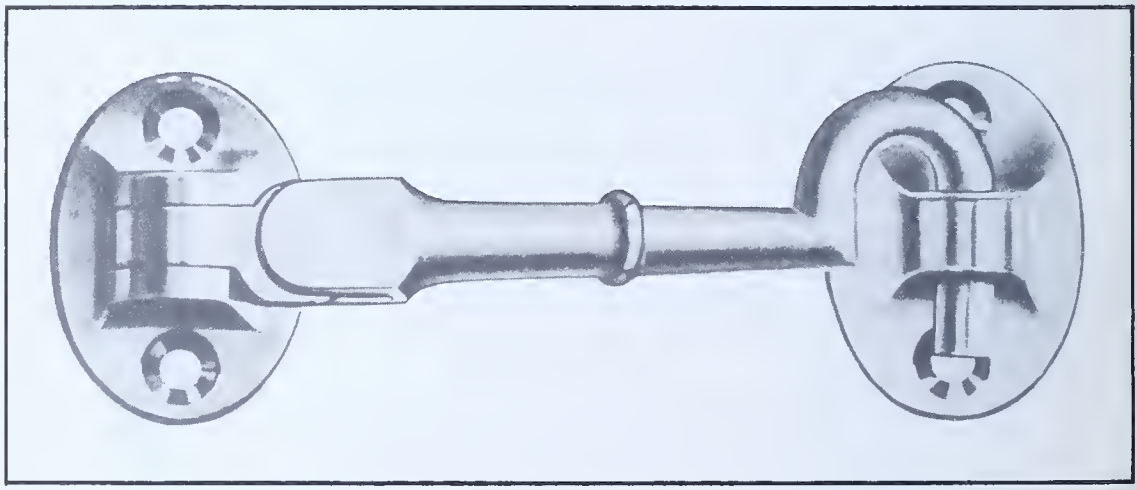


FIG. 114 — *6″ Ajar Hook*

JOB SHEET NO. 24
INSTALLING MISCELLANEOUS FURNITURE

General Information

There are many pieces classified as furniture that are installed on a ship, but which are not common to every room. These include binnacle boxes in wheelhouse, carpenter's bench in the carpenter shop, flag locker in the wheelhouse, furniture in mess room, etc. Consult the plan for these various pieces.

Tools

1. Hack saw frame
2. 6′ Rule
3. Claw hammer
4. Automatic screwdriver

Material

Articles as listed on sketches and as shown on plan.

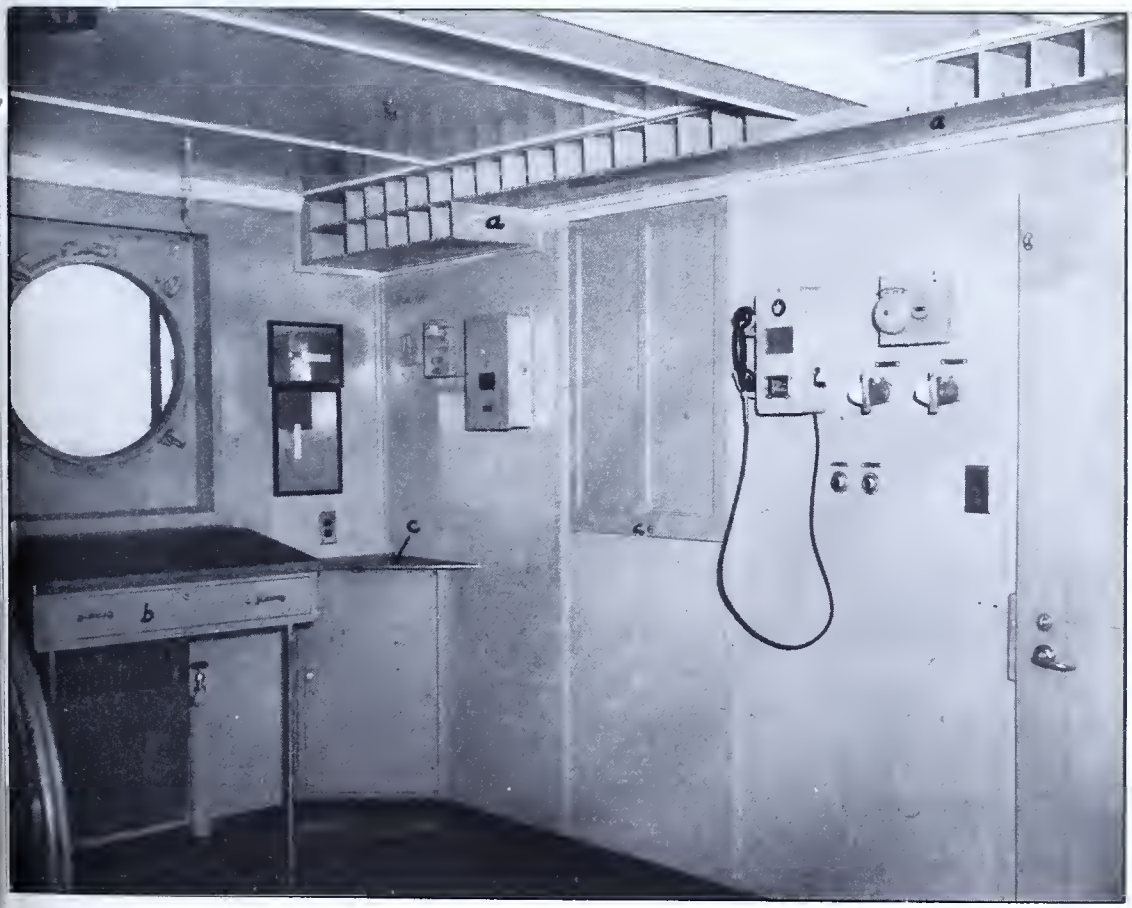


Fig. 115 — *Showing the Flag Locker "a", Log Desk "b", and Coffee Table, "c"*

FIG. 116 — *Crews' and P. O.'s Mess Room*

SAFETY SUGGESTIONS

Avoid injuries from nails when uncrating.

PROCEDURE

1. Select and uncrate, if necessary, the piece in question.
2. Locate the article in the room as shown on the plan.
3. Install the article according to instructions and drawing detail.

QUESTIONS

1. **What are the miscellaneous pieces required for the ship on which you are working?**
2. **What type and size of screws are used to secure each piece in place?**

JOB SHEET NO. 25
INSTALLING GALLEY FURNITURE

General Information

The galley on a ship serves the same purpose as the kitchen in a house. The galley furniture is located in the galley as shown on the plan. In the design of all galley furniture, dressers, etc., the importance of sanitation is paramount. Corners are rounded as a safety precaution.

The services of a welder will be needed on this job.

Tools

1. 6′ Rule
2. Hack saw frame
3. Claw hammer
4. File with handle

Material

Approved type galley furniture according to the drawing details.

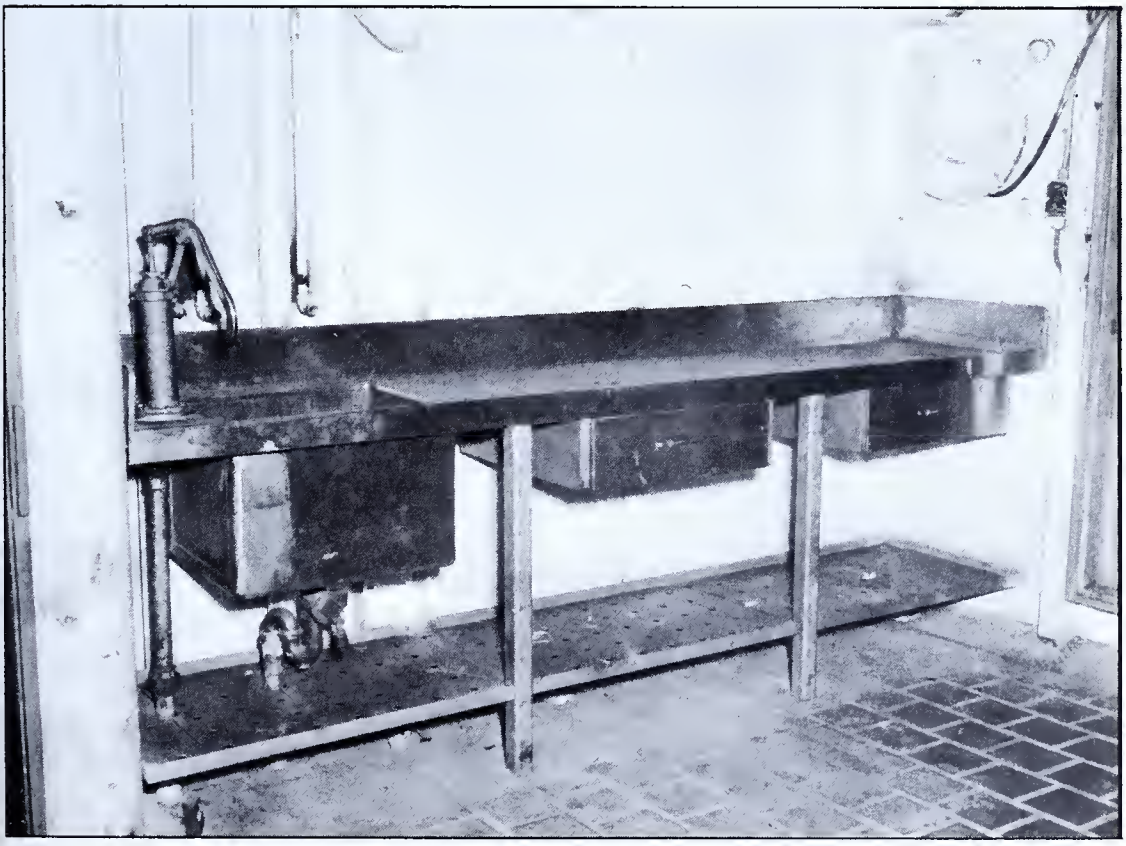


Fig. 117 — *Galley Furniture, Sink, and Dresser*

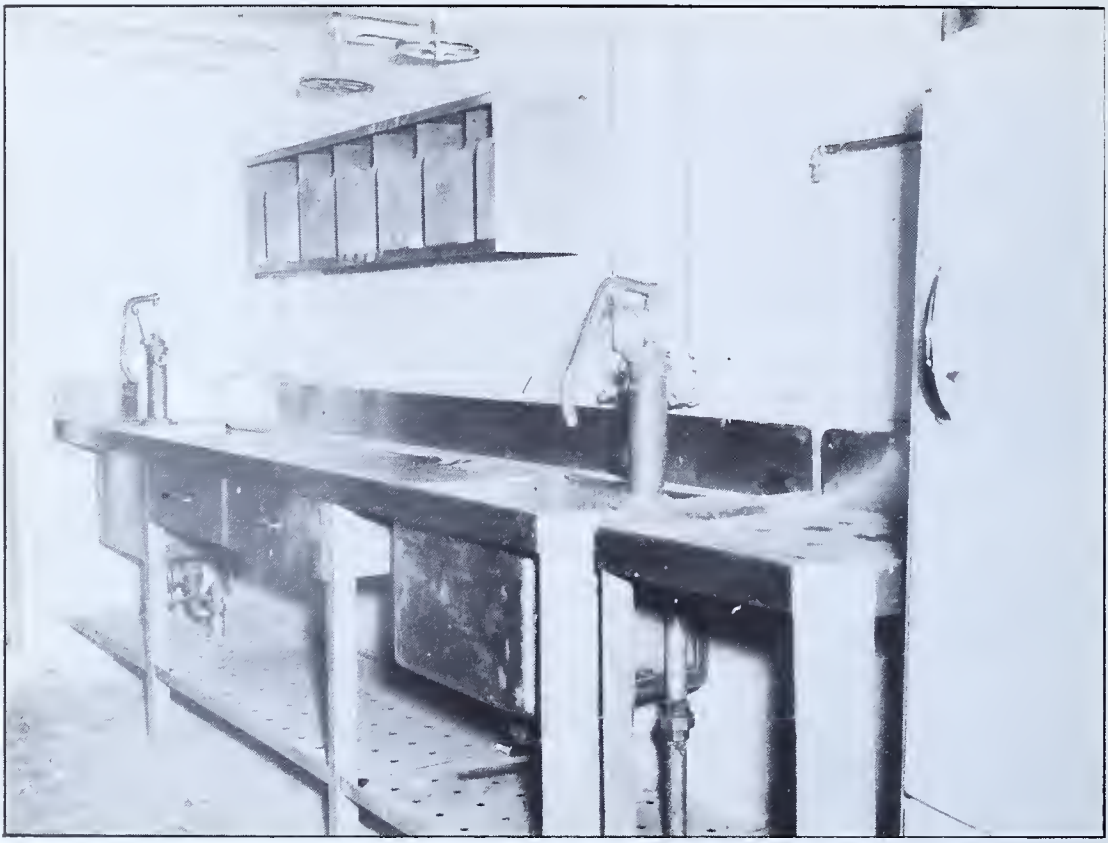


FIG. 118 — *Pantry Furniture, Sink, and Dish Rack*

SAFETY SUGGESTIONS

Be careful when uncrating. Avoid injuries from nails. Do not leave nails sticking up in boards.

PROCEDURE

1. Uncrate the galley furniture.
2. Locate the position of the pieces in the galley. See plan.
3. Set furniture as instructed and according to the plan.
4. Have welder weld the furniture to the decks and bulkhead.

QUESTIONS

1. **What is the galley?**
2. **Where is the galley located on the ship upon which you are working?**
3. **How is the galley furniture secured in place?**
4. **List the galley furniture necessary for the ship upon which you are working.**
5. **Locate the position of each piece.**

JOB SHEET NO. 26
INSTALLING BOXES AND FIXTURES ON DECK

General Information

There are a few boxes and fixtures which the joiner installs on the deck. These include the Lyle Gun Box, and Lockers, etc. See the plan for these various boxes and their locations.

The services of a welder will be needed on this job.

Tools

1. Hack saw frame
2. 6′ Rule
3. Adjustable wrench

Material

Articles as listed on sketches and as shown on the plan.

Safety Suggestions

Avoid the flash from the welder's torch.

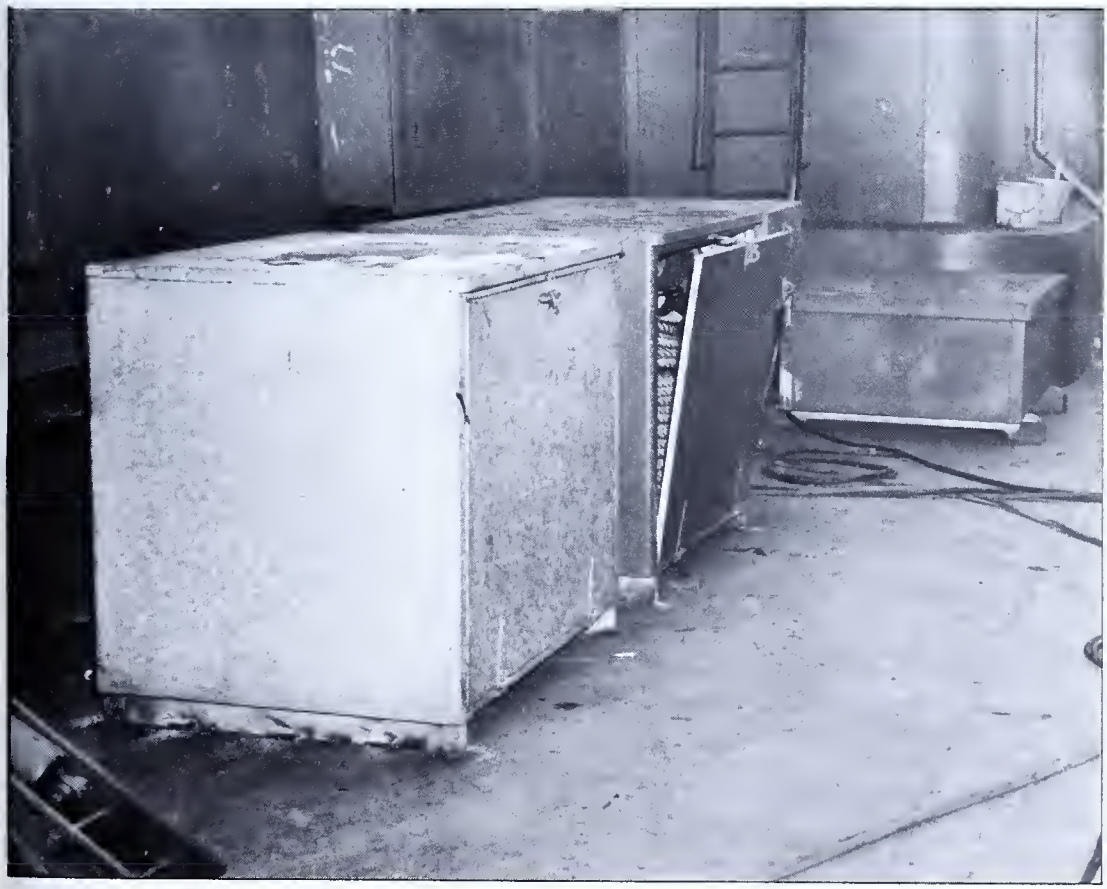


Fig. 119 — *Lyle Gun Box, and Life Preserver Box on Deck*

PROCEDURE

1. Locate box on deck. See plan.
2. Determine how article is to be fastened. See drawing detail.
3. Have angle clips welded to deck in proper place and position.
4. Set box in place.
5. If the article is to be bolted down have the proper size hole drilled through the angle clip and the leg of the box or locker.
6. Bolt the article in place.
7. Remove the ends of bolts protruding above the furniture surface. Use a hack saw to saw off the ends of the bolts.

QUESTIONS

1. **Name the boxes and fixtures required on the deck of the ship upon which you are working.**
2. **What is the location of each item?**
3. **How is each piece fastened to the deck?**

JOB SHEET NO. 27
INSTALLING CERTIFICATION PLATES AND NOTICES

General Information

Every room on a ship must meet certain standard requirements which are specified by the Steamboat Inspection Commission regarding the number of cubic feet of space available per man. When these requirements are fulfilled a certification appears in the room stating the greatest number of persons that should occupy that room. The certification may be a strip of metal over the door, or in the case of a steel bulkhead it is chipped in the steel bulkhead. If the room does not have a ceiling it may be stenciled on the beam nearest the door.

Fig. 120 — *Typical Name Plate*

On the outside of the door frame at the top appears a name plate, identifying each room. Example: "First Officer", "Captain's State Room", "Galley", and so on.

Notices of different kinds appear on a ship. They can be divided into two classes: 1) Steamboat inspection requirements, and 2) company requirements as instructed by their agent.

Tools	Material
1. Center Punch	Certification plates as per sketch.
2. Hammer	Name plates as per sketch.
3. 6′ Rule	Notice frames as per sketch.
4. Automatic screw driver	

FIG. 121 — *Notice Frames Installed in Wheelhouse*

PROCEDURE

1. Select the proper certification plate for the room in question.
2. Locate the plate in the room. See Typical detail Fig. 120.
3. Drill proper size hole for screws.
4. Secure plate to bulkhead using proper size and type screws according to screw detail.
5. Follow the same procedure for name plates.
6. Select the notice frames for the ship.
7. Drill holes in the frames for screws.
8. Locate the frames in the various rooms.
9. Secure in place using the proper size screws.

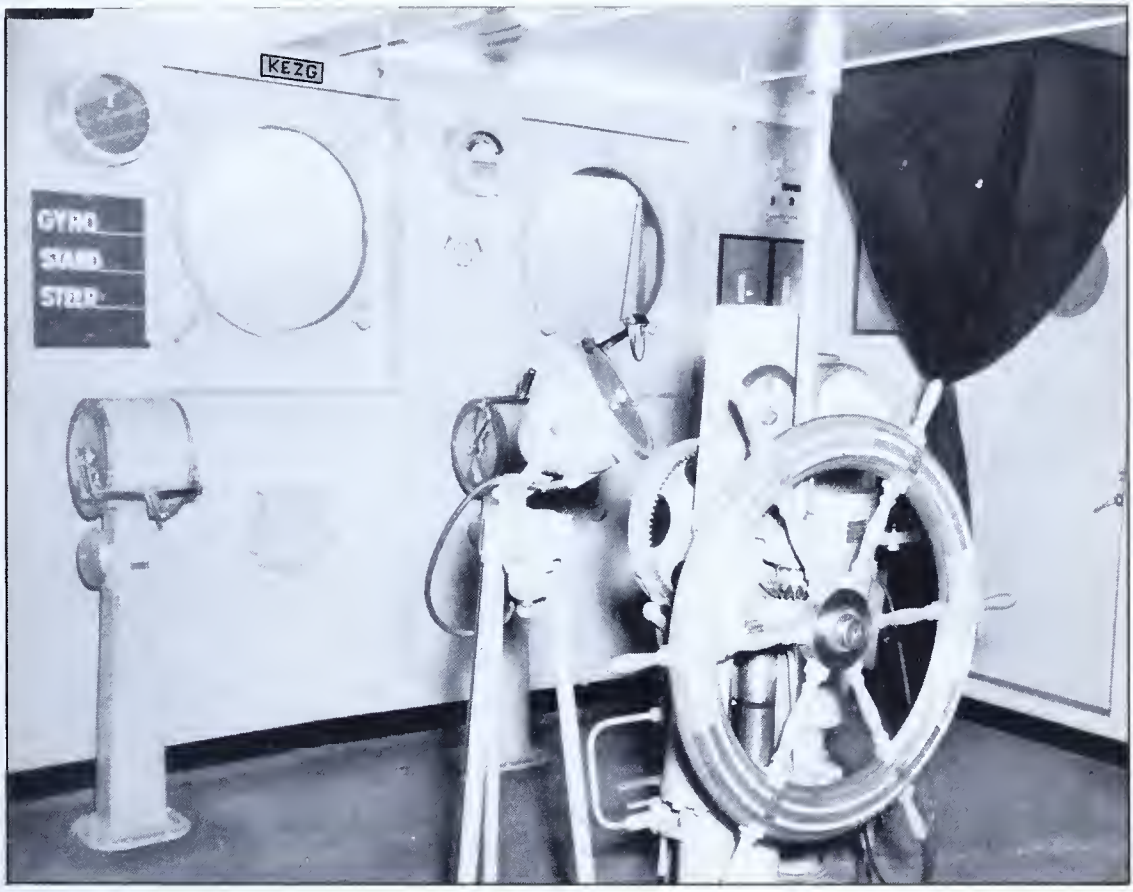


FIG. 122 — *View in Wheelhouse Showing Call Letters and Notice Frames*

QUESTIONS

1. **Why are certifications necessary on a ship?**
2. **Who passes on these certifications?**
3. **Of what use are name plates?**
4. **Where are these to be found on a ship?**
5. **Where are the certifications located on a ship?**
6. **What two classes of notices appear on a ship?**
7. **What type and size of screws are used to fasten certification name plates and notices into place?**

JOB SHEET NO. 28
INSTALLING LINEN LOCKERS

General Information

The linen lockers can be located by referring to a plan drawing. The drawing detail will show how and where the shelving is installed in these lockers.

Tools

1. 6′ Rule
2. Hand saw
3. Jack plane
4. Claw hammer
5. Square
6. Adjustable wrench

Material

Approved shelving according to drawing detail.

Note: This shelving is not always a solid shelf as we commonly think of a shelf, but often the shelves are in a grate form. See Fig. 123.

Fig. 123 — *View Showing Shelving in Linen Locker*

Procedure

1. Select the proper material according to specifications.
2. Cut material to length given on the blueprint.
3. Fit material in place as follows:
   (a) Frame out the linen locker to receive the grating. Consult the drawing for location and dimensions.
   (b) Construct the grating or shelves (whichever is specified on the drawing).
4. Fasten with approved nails, screws, or bolts, as specified.

QUESTIONS

1. **Where are the linen lockers located on the ship on which you are working?**
2. **What name is given to the type of shelving used in these lockers?**
3. **How are the shelves secured in place?**

JOB SHEET NO. 29
INSTALLING GRATINGS

General Information

See plan for location of gratings. Some of the places where gratings are installed are the engine room, and bos'n stores. In some cases the grating is already made up; at other times it is received knocked down, and will have to be made up.

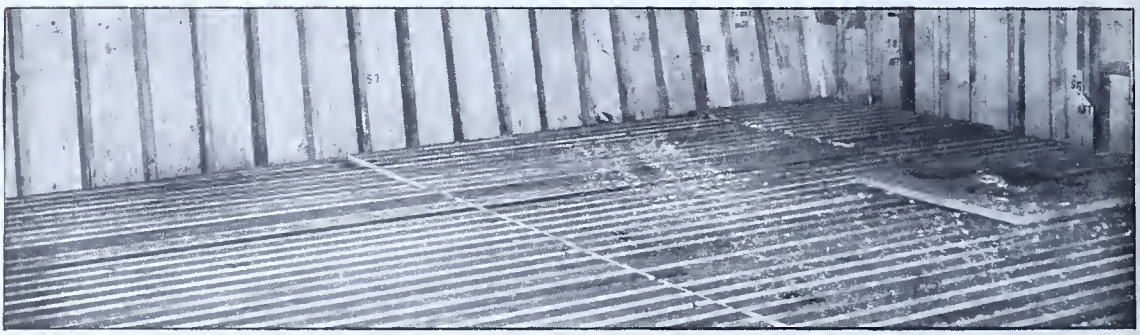


Fig. 124 — *Showing Grating in Refrigerated Cargo Hold*

Tools

1. 6′ Rule
2. Hand saw
3. Claw hammer
4. Square
5. Jack plane

Material

Approved grating. See plan for location and drawing detail for type of grating to use.

Procedure

1. From the plan, locate gratings.
2. Determine if they are assembled or knocked down.
3. If assembled, place them as shown on the plan.
4. If knocked down, construct them to proper size and shape.
5. Place all gratings.

QUESTIONS

1. **Of what use are gratings on a ship?**
2. **Where are gratings located on the ship on which you are working?**

JOB SHEET NO. 30
BUILDING AN ACCOMMODATION LADDER

General Information

An accommodation ladder is used by the passengers and crew when boarding or leaving the ship while the ship is at anchor. A small boat is used to transport passengers and crew between the shore and the ships, or between ships. Accommodation ladders are sometimes made as long as 40′; they must be very strong and light. The accommodation ladder is built in the shop by the joiner.

Material

Best grade of oak, white pine, ash, or mahogany, galvanized sockets, galvanized stanchions, scarphbands, end bands, tie rods, bolts, screws, and deck plugs.

Tools

Complete set of personal tools.

Fig. 125 — *Accommodation Ladder*

Procedure

A. Consult the drawing for the width and length and detailed construction of the accommodation ladder.

B. Proceed to prepare the stock for building the accommodation ladder as follows:

1. Dress all lumber for proper thickness.
2. Plane all lumber to proper width.
3. Saw all lumber to proper length.

4. Make any odd cuts, such as rounding off corners, making the scarph joint, cutting out for treads, and so on.
5. Bore holes for any bolts or lag screws.
6. Assemble wooden part of ladder.
7. Install all hardware.
8. Sand the ladder so it is ready to receive the finish.

QUESTIONS

1. **What is the use of the accommodation ladder?**
2. **What kind of material is used to make this ladder?**
3. **Is it necessary to know how to read a blueprint, in order to construct an accommodation ladder? Why?**

JOB SHEET NO. 31
BUILDING A GANGWAY LADDER

General Information

The gangway ladder is built in the joiner shop and fitted with all necessary hardware as indicated on the blueprint.

The gangway is used as a means of boarding or leaving the ship when the ship is docked against the pier. The gangway is equipped with wheels so that it is free to move and change its position with the changing of the tide or the changing of position due to the draft of the ship when loading or unloading.

Fig. 126 — *Gangway Ladder*

Materials

First grade white pine or fir, flooring slats, tie bolts, stanchions, wheels, band iron eye bolts, galvanized rails, brass wood screws.

Tools

Complete set of personal tools.

PROCEDURE

1. Check blueprint to be sure you understand the job.
2. Select material for job.
   NOTE: Dimensions for lumber sizes are found on the blueprint.
3. Dress all lumber to proper thickness.
4. Plane all lumber to proper width.
5. Cut all lumber to proper length.
6. Lay out crown on top rail and cut to size. See the blueprint.
7. Cut all mortise joints and fit to size.
8. Assemble ladder.
9. Install all hardware according to the plan.
10. Sand ladder so that it is ready to receive finish.

QUESTIONS

1. **For what purpose is the gangway used?**
2. **Why is it equipped with wheels?**
3. **Why are cleats used on a gangway ladder?**

JOB SHEET NO. 32
INSTALLING DODGER BOARDS

General Information

Dodger boards or wind breakers, as they are sometimes called, are built on top of the rail above the bulwark to protect the men on the bridge, from spray or wind when the ship is in a heavy sea or rough weather. Only the best material is used in making these boards.

Fig. 127 — *Dodger Board in Closed Position*

Tools	Materials
Complete set of personal tools.	Teak or best grade of oak, brass screws brass straps and brass barrel bolts.

Procedure

1. Check blueprint to make sure you understand the job.
2. Check the ship to be sure that the rail and stanchions are in place.

3. Fit frames or end boards to rail and to stanchions.
4. Fasten frames in place, using brass straps and screws according to the drawing detail.
5. Cut bottom board to length; bevel and fit to rail.
   NOTE: Measure for length on the job.
6. Fasten bottom board in place.
7. Cut top board to length; fit to bottom board.
   NOTE: Measure for length on the job.
8. Install hinges so top board can drop down. Fig. 128.
9. Install barrel bolts to fasten board when it is put up. Fig. 127.

FIG. 128 — *Dodger Board in Open Position*

QUESTIONS

1. **Are dodger boards installed on all ships?**
2. **Why is brass hardware used?**
3. **Why are dodger boards constructed on a bevel?**

JOB SHEET NO. 33
SHAPING AND INSTALLING HAND RAIL

General Information

The top of the bulwark, around the bow and stern of a ship, is finished off with a wooden strip fitted over the edge. This wooden strip is called a hand rail or cap. It is finished off smoothly and suitably varnished to present a fine appearance. Several lengths of material are used and fitted at the ends with a scarph joint. This makes a strong, smooth joint.

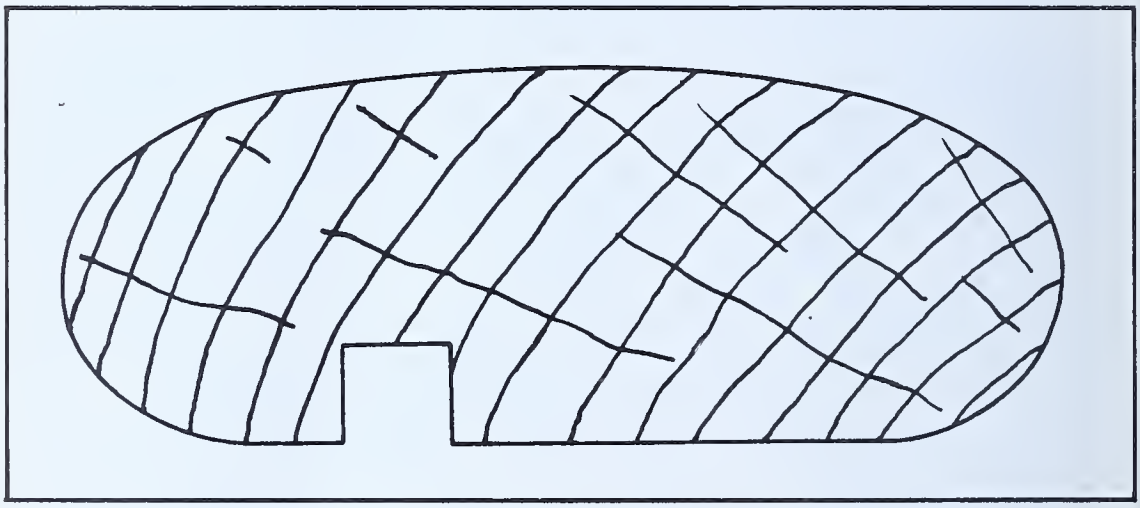


Fig. 129 — *End View of Hand Rail*

Tools

1. Mallet
2. Chisel
3. Bevel
4. Hand saw
5. Hammer
6. Jack plane
7. Spoke shave
8. Scraper
9. Brace and bits, sizes of bits: 1 1/8", 13/16", 3/8"

Materials

Teak, oak, ash, fir, mahogany; size of wood is 2½" x 6" and long enough for the bulwark to be covered.

Procedure

1. Consult the blueprint to find the rail size.
2. Cut out a template for end-of-rail shape.
3. Mark the shape on the end of the rough rail stock.

4. Machine a groove the full length of the rail as shown in Fig. 129.
   NOTE: Use a power saw with a dado head to cut the groove in the rail.
5. Rough-cut the corners of the rail to the template mark as shown in Fig. 130.
6. Use the jack plane to roughly round the rail to shape.
7. With scraper remove all tool marks.
8. Smooth the rail with sandpaper.
9. Take measurements from the bulwark to find the length of the rail.
10. With the hand saw cut the rail to length. (Use a scarph joint where lengths meet.)

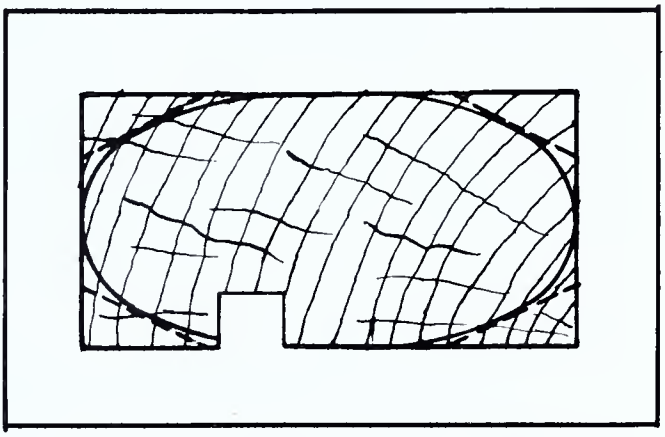


FIG. 130 — *End View of a Piece of Wood to be Shaped for a Hand Rail*

11. Carefully fit the rail to the bulwark.
12. Use C-clamps to hold the rail temporarily.
13. The pipe stanchion flange has been drilled to fit screw heads. Secure the rail to the bulwark with the right size screws to fit stanchion screw holes.
    NOTE: If the specifications call for the hand rail to be bolted to the bulwark, the rail will have to be drilled, counterbored and after the bolts are installed, the holes must be plugged.
14. Smooth off the plugs to the rail (if bolts are used).

QUESTIONS

1. **Describe the first operation necessary when fitting a hand rail.**
2. **Explain how a hand rail is joined together to make a continuous job.**
3. **Name two methods of fastening a hand rail to the bulwark.**
4. **For what purpose is a scraper used when finishing a hand rail?**

JOB SHEET NO. 34
LAYING DECK

General Information

Tankers and cargo ships of welded steel construction are equipped with wood decking at certain locations. The wood deck on a steel ship provides insulation for the crew's quarters and the cargo hold, protecting them from the heat of the sun. The boat deck, the bridge and often the navigation and flying-bridge decks, are covered with wood decking. The appearance of the ship is improved by the installation of decking. See Fig. 131.

Material for Decking

The best decking material is yellow pine, fir, or teak and it must be edge grain or quarter sawed for the best results. Inferior grades of lumber are never used.

Laying Decking

Usually the ship's decking is laid in a fore and aft direction. See Fig. 131. Where the ends of the decking material meet the curve of the ship at the bow and at the stern, the strips of decking are cut and fitted as shown in Fig. 132. This cutting and fitting is called "nibbing". The nibbing removes the possibility of thin, pointed ends being left on the decking strips.

Workmen Employed

Decks are laid by skilled mechanics. After gaining experience as a helper the workman is capable of laying deck under the supervision of a skilled workman.

Safety Precautions

Certain hazards peculiar to the laying of decking must be avoided. The deck-bolt holes are bored from the underside of the decking through the steel deck and into the decking strips. These bolt holes are likely to come through just where one is standing. Be careful to avoid injuries that may be received this way. If injured report to the dispensary at once. Take no chances with possible infection.

Tools

1. Square
2. Bevel
3. Saw
4. Chisel
5. Mallet
6. Hammer
7. Adz
8. ½″ Bit
9. Brace
10. Plug bit
11. Maul
12. Wrench
13. Air motor
14. B & O backing out punch

Materials

1. Decking 3″ x 5″, No. 1 quartersawed pine, fir or teak.
2. White lead
3. Lamp wick
4. ½″ Deck bolts

PROCEDURE:

FIRST OPERATION, cut out nibs.

1. Measure the length of the space to be decked, fore and aft. (Measure on the job.)

FIG. 131.— *A Portion of a Wooden Deck*

2. Cut two pieces of decking to the length found in Step 1.
   (To fit as shown at "a" and "b," see Fig. 132.)

3. The two pieces cut in Step 2 are laid so that the joint between them is located on the deck center line. See Fig. 132.

   NOTE: The deck-bolt holes were laid out before starting to lay the decking from the center line which was marked on the deck.

4. The first two strips of decking are carefully lined up straight and wedged in position. See reference sheet No. 9, Fig. 148.

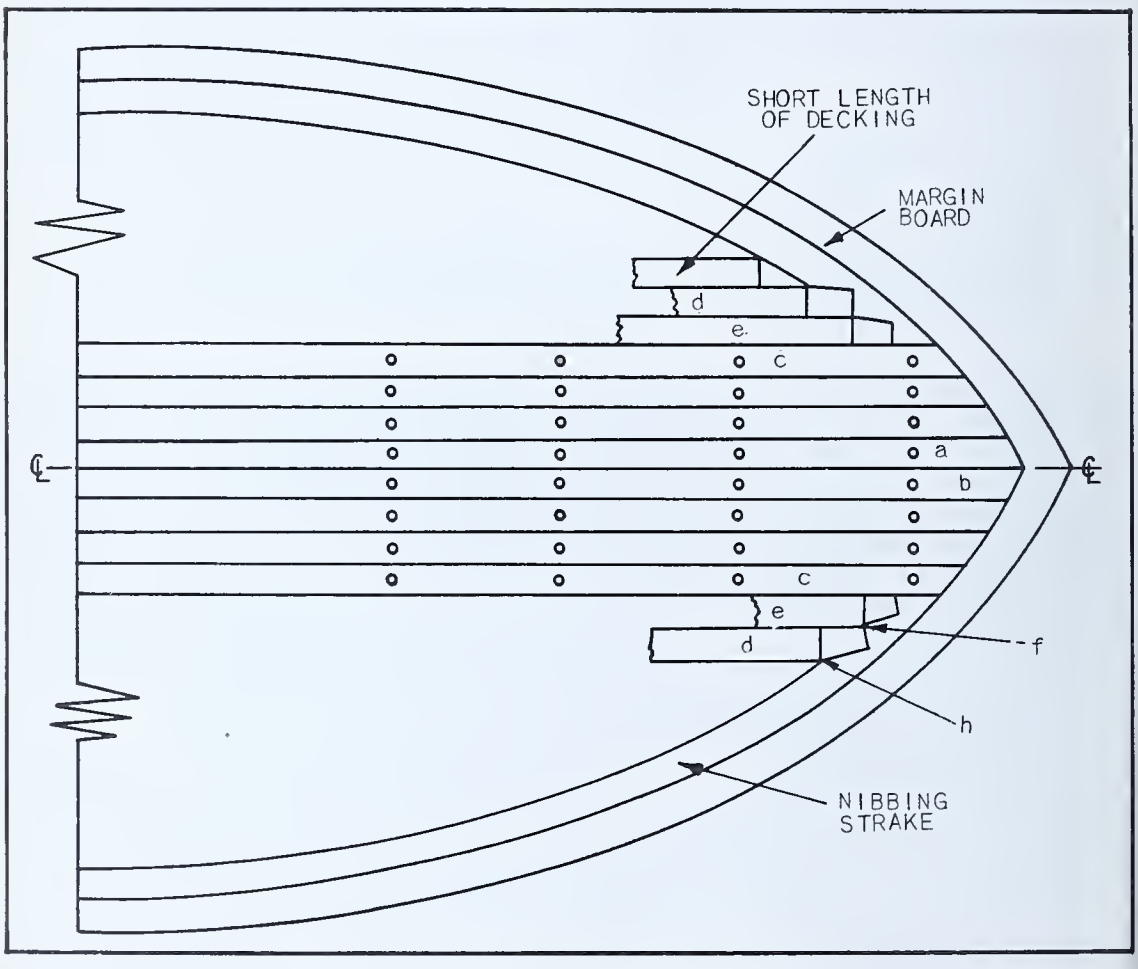


FIG. 132 — *Laying Deck.* (*Locating Nibs*)

5. Proceed to lay strips of decking on both sides of the two strips laid in Step 3. See Fig. 132.

   NOTE: Nibbing may become necessary when the fifth or sixth strip of decking is laid.

6. Cut a full length strip of decking for the first nibbing piece. See "e", Fig. 132.

7. Wedge the piece, cut in Step 6, against the margin board. (See Fig. 148, Reference Sheet No. 9)

8. With this short piece of decking "e" held hard against the piece of decking "c" fastened down, shove it ahead until it hits the margin strake, thus locating a point on the margin strake. See Fig. 132 at "f".

NOTE: Figure 133 shows how the location and the shape for each nib cut-out is obtained. Shoving the short piece of decking ahead until it hits the margin strake as in Step 9 above gives the locations of the sides of the decking strip. Note the three pairs of lines that are projected ahead of the decking strips "a", "b", and "c". The left hand lines in each pair of double lines are the joints between the decking strip. (This space may be a little more than 1/3 the width of a decking strip but it must never be less.)

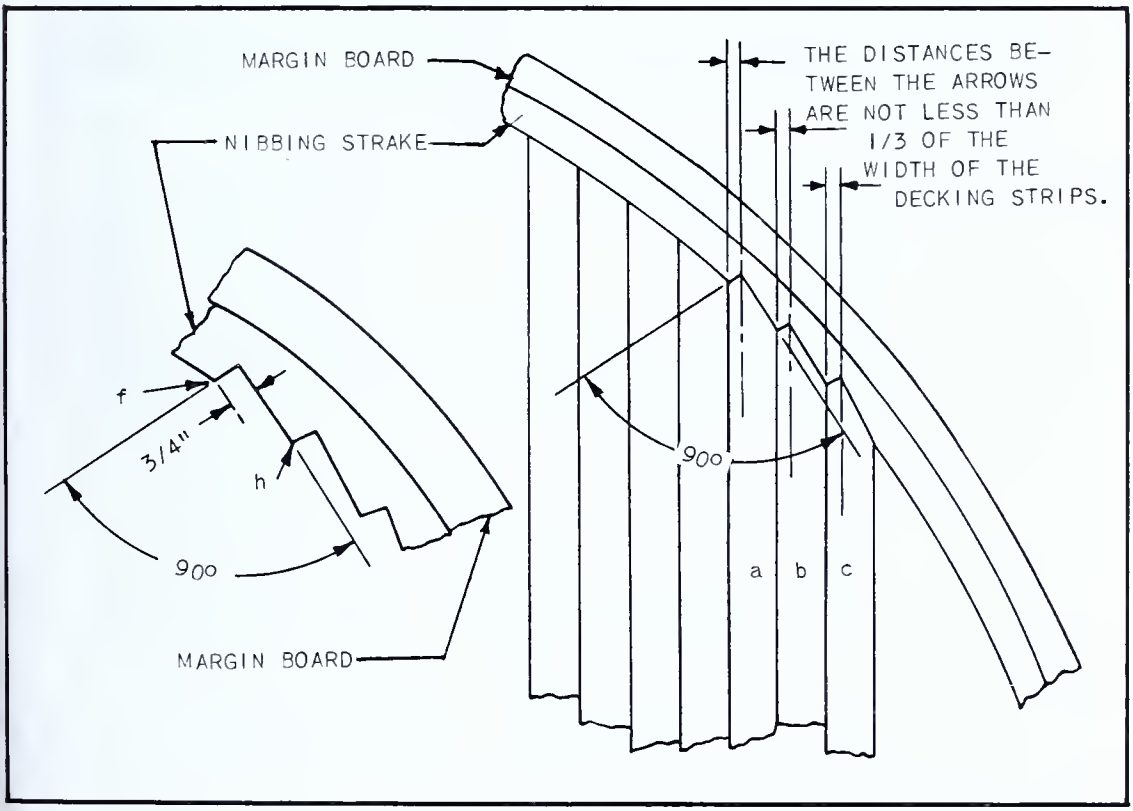


FIG. 133 — *Laying Out for Nib Cut-Outs*

The inset in Fig. 133 shows an enlarged view of the nib cut-out. Points "f" and "h" are the points obtained in Step 8 and are shown on Fig. 132. With a steel square, or with the end of a steel scale cutting these points as shown by the 90 degree angle, scribe a line to mark the cut-out. The cut-out must not be more than ¾" deep, as shown. The cut-outs are all laid out on the nibbing strake, cut out, and smoothed up before any of the decking is fitted into place in the nibs.

9. Lay a second piece of short decking "d" against the short piece of decking "e" as was done with "e" against "c" in Step 9.
10. Shove the piece "d" forward until it stops against the margin strake, (Fig. 132.)
11. Mark around the angle of the square, on the margin strake, as explained in the note above. See Fig. 133.
12. Mark all the remaining nibs in the same manner.
13. When all the nib cut-outs have been worked, remove the margin strake and cut to the lines marked.
14. Smooth up the cut-outs in the margin strake.
15. Replace the margin strake and wedge in place.
16. Go below and bore bolt holes in margin board.

FIG. 134 — *End View of Laid Decking*

17. Install the deck-bolts.
18. Apply white lead to the bolt head and to the counter-bored holes.
19. Plug the bolt head holes.

QUESTIONS

1. **Why is it necessary to perform the operation of nibbing?**
2. **When is the nibbing operation performed on the margin board?**
3. **Explain the reason for putting a "seam" on the strips of decking.**
4. **At what point on the deck is the decking operation started?**
5. **Why is it necessary to change templates as the work of cutting nibs progresses?**
6. **Why are the bolt holes bored from the under side of the decking strips?**

JOB SHEET NO. 35
DUBBING AND DRESSING THE DECK

General Information

The process of smoothing the high spots on the finished decking and the preparations for calking are referred to as "dubbing and dressing the deck". The uneven surfaces which appear on all decks, no matter how carefully they are laid, must be removed and the deck made reasonably smooth. Fig. 135 shows a typical cross section of a wood deck before dubbing and dressing.

Roughing Off High Spots

The high spots are first roughed to a level surface by using a ship adz, with the blade turning up into lips on both sides of the cutting edge. See Fig. 136. If the cutting is done with the grain of the wood the adz may be forced into the surface too far or the grain of the wood may "show" and cause unsightly places on the surface. Keep the cutting edge sharp. Cutting across the grain will eliminate any possibility of the wood slivering. The skilled mechanic will always cut across the grain.

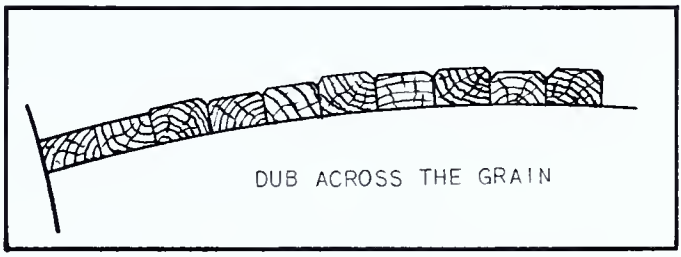


Fig. 135 — *Decking Before Dubbing*

Smoothing the Deck

After the deck has been dubbed with the adz the smoothing plane is used to make the surface even and smooth. The smoothing plane may be used in any direction which the grain of the wood makes necessary to secure a smooth job.

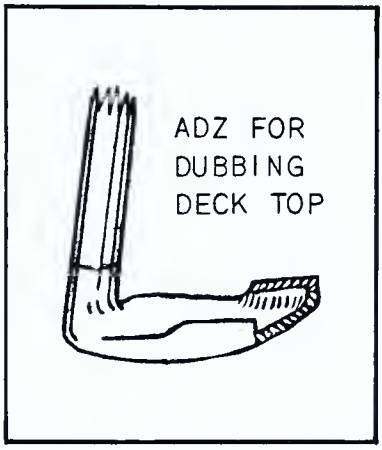


Fig. 136 — *Ship Adz for Dubbing Decks*

Tools

1. Adz (turned up lips)
2. Smooth plane
3. Oil stove

Procedure

1. Begin at one end of the decking and at the center of the deck.
2. Dub across about three deck planks at a time.

3. Move along and continue working with the adz to where high spots end.
4. Work back to the starting point on the next few rows of deck planks.
5. Continue using the adz in this manner until the entire decked surface is roughed off.
6. Use the smoothing plane to smooth the surface.

QUESTIONS

1. **Along which way of the grain should the deck be dubbed?**
2. **Explain the particular skill needed to use an adz correctly.**
3. **How does a dubbing adz differ from a regular adz?**

Part V
REFERENCE SHEETS FOR PROCEDURES IN SHIP JOINERY AND INSTALLATIONS

REFERENCE SHEET NO. 1
CALCULATING BOARD FEET

When stating the dimensions of stock, the thickness is always given first, then the width, and the length last. The size of the stock should be listed in a material bill in the order shown in the following example.

MATERIAL BILL

No. Pieces	Thickness	Width	Length	Description
2	3/4"	36"	8'	Panels
4	5/8"	24"	6'	Panels

Lumber is generally sold by the board foot, or in larger quantities by the 1000 (m) board feet. Some special kinds of stock, however, such as moldings, are sold by the linear foot; other stock, including shingles and laths, are sold by the bundle; panels and plywood are sold by the square foot.

The following formula may be used to find the number of board feet in a piece of stock. (Board feet is written Bd'.)

$$\frac{\text{No. of Pcs. x thickness in inches x width in inches x length in feet}}{12} = \text{Bd}'$$

For example:

How many board feet are contained in 5 boards 1" x 10" x 20' long?

Solution: $\dfrac{5 \text{ Pc. x } 1'' \text{ x } \cancel{10''} \text{ x } \cancel{20'}}{\cancel{12}\ \cancel{6}\ 3} = \dfrac{5 \text{ x } 10}{3} = \dfrac{250}{3} = 83\text{-}1/3 \text{ Bd}'$ (Ans.)

How many board feet are contained in 3 boards 1″ x 8″ x 3′ long?

Solution: $\dfrac{\cancel{3}\ \text{Pcs.} \times 1'' \times \overset{2}{\cancel{8}}'' \times 3'}{\underset{4}{\cancel{12}}} = 6\ \text{Bd}'$ (Ans.)

If the length is given in inches, use 12 x12 as the denominator, since there are 144 square inches in one square foot.

For example:

How many board feet are contained in 3 boards 1″ x 8″ x 42″ long?

Solution:

1st step $\dfrac{\cancel{3}\ \text{pc.} \times 1'' \times 8'' \times 42''}{\underset{4}{\cancel{12}} \times 12} =$ 2nd step $\dfrac{1'' \times \overset{2}{\cancel{8}}'' \times 42''}{\cancel{4} \times 12} =$

3rd step $\dfrac{1'' \times \cancel{2}'' \times 42''}{\underset{6}{\cancel{12}}} =$ 4th step $\dfrac{42}{6} = 7\ \text{Bd}'$ (Ans.)

Surfaced lumber seldom is found to be the full dimension listed. Stock listed as 2″ x 4″ is sawed to this size in the rough, but when it is surfaced or "dressed" it is reduced to approximately 1¾″ x 3¾″. One inch dressed stock usually is ¾″ to ⅞″ in thickness. In computing board feet, however, one inch is considered as being a minimum thickness.

PROBLEMS

Find the number of board feet in the following groups of boards:

1. 10 Bds. — ⅞″ x 10″ x 16′
2. 100 Bds. — ¾″ x 8″ x 14′
3. 32 Bds. — 13/16″ x 12″ x 20′
4. 24 Bds. — 2″ x 6″ x 14′
5. 96 Bds. — 1″ x 4″ x 16′
6. 48 Bds. — ⅝″ x 12″ x 10′
7. 90 Bds. — ¾″ x 10″ x 8′
8. 36 Bds. — 2″ x 8″ 14′
9. 18 Bds. — 1⅝″ x 10″ x 12′
10. 6 Bds. — 15/16″ x 10″ x 10′

PROBLEMS

Find the cost of each of the groups of boards listed above.

The cost per Bd′ is 12½c.

REFERENCE SHEET NO. 2
NAILS: TYPES, SIZES, AND USES

The first nails were cut by hand from small strips of soft metal. In the year 1786, a machine for making nails was patented in the United States. This machine has been improved until nails can now be made at the rate of 100 to 1000 per minute, depending upon the size. Most nails are now made of wire.

The nails most frequently used in woodwork are: brads, finishing nails, casing nails, common nails, and box nails, (Fig. 137). They are usually divided into three groups, according to size: (1) brads, (2) nails, and (3) spikes. The brad is merely a small finishing nail ranging in length from 1/4" to 1 inch. It is used to nail thin stock together. The sizes of nails and spikes are usually indicated by the term "penny" which is derived from the weight of 1000 nails. For example, 1000 eight-penny (8-D) nails will weigh eight pounds. The lengths of the various nails are shown in the nail chart, Fig. 138. From this chart it will be found that the 2-D nail is 1 inch long, the 4-D nail is 1 1/2 inches long, etc.

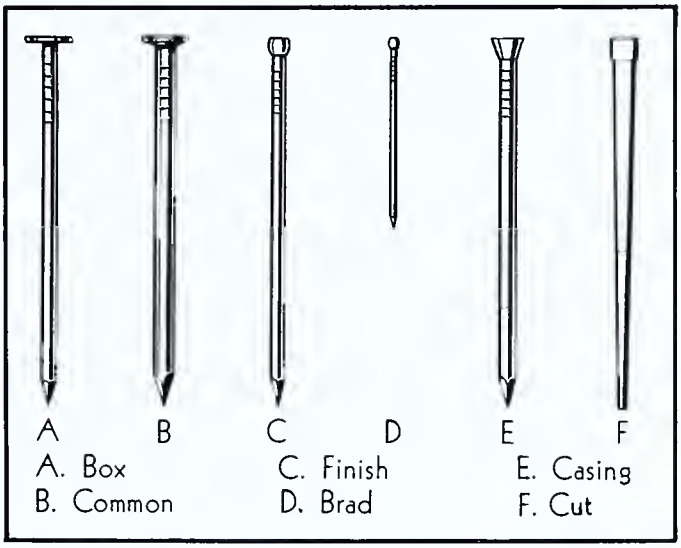


FIG. 137 — *Kinds of Nails*

PENNY SIZE	LENGTH IN INCHES	WIRE GAUGE			
		COMMON NAILS	BOX NAILS	FINISH NAILS	CASING NAILS
2	1	15	16	17	16
3	1 1/4	14	15	16	15
4	1 1/2	12	14	15	14
5	1 3/4	12	13	14	14
6	2	11	12	13	13
7	2 1/4	..	12	12	12
8	2 1/2	10	11	12	11
10	3	9	11	11	11
12	3 1/4	9	..	11	10
16	3 1/2	8	..	11	10
20	4	6	..	10	9

FIG. 138 — *Nail Chart*

Square-cut nails (Fig. 137 at "F") are used chiefly for nailing large hinges in place on rough construction work. They have more holding power when clinched than the common round nail.

Finishing nails, as the name indicates, are used on finished surfaces where the heads of nails should not be visible. The small heads allow them to be driven below the surface with a nail set. The hole left by the head is then filled with putty, plastic wood, or stick shellac.

The finishing nail is usually made of smaller gauge wire than the common nail; it will not split the wood so readily as the heavier nail. Since this nail has a very small head (Fig. 137 at "C"), it does not have as much holding power as the common nail.

Casing nails are similar to finishing nails, but they have a larger head, which gives them more holding power. The head of this nail is cone-shaped (see Fig. 137, at "E"). The casing nail is used largely for nailing door and window casings and for fastening other interior trim in place.

Common nails have large, flat heads and are used where it is not objectionable for the heads to show and where more holding power is desired. The wire gauge of the common nail is heavier than the gauge of the box nail. The head of the nail, too, is thicker than the head of the box nail (Fig. 137 at "B"). An examination of the nail chart (Fig. 138) will show that the common nail is made in a larger variety of sizes than any other nail. The largest size indicated in the chart is 20-penny. These common nails, however, may also be obtained in sizes of 30-, 40-, 50-, and 60-penny. The longest of these nails, the 60-penny is 6 inches long. Nails larger than 20-penny are commonly called spikes.

The box nail is like the common nail except that it is smaller in diameter and its head is thinner (Fig. 137 at "A"). Since it is made of smaller wire, it can be used to nail thin stock and other stock which is likely to split when nailed with the common nail. The head of the box nail, being thin, does not have as much holding power as the common nail. The box nail derives its name from its earliest use, which was the nailing of packing crates and boxes.

A cement coating sometimes is applied to nails to give them more holding power. Some nails are treated with a zinc coating which resists corrosion

REFERENCE SHEET NO. 3
WOOD SCREWS: TYPES, SIZES AND USES

Wood screws were first made by placing blank pieces of metal in the forge and heating them until the heads could be "pinched" to shape between a set of dies. The threads were then filed on the blanks. This slow and tedious process of making wood screws by hand has been replaced by accurate, high-speed, screw-cutting machines. The first machines for making screws were built in England about 1760. The first screws that were made either by machine or by hand were not tapered, and they were blunt on the end. In 1849, Cullen Whipple, of Providence, Rhode Island, invented a practical device for manufacturing tapered, pointed screws.

In the present process of manufacture, the wire from which the screws are made is first fed into a machine which first cuts the blank to length and forms a head on one end. The slot is then cut in the head by feeding it against a small circular saw. The blank screw is next passed through the threading machines, and the threads are cut.

During the entire process of machining the screw, a flow of lubricating or cooling liquid is maintained upon the blank and the cutting tool to prevent heating. A solution of soda and water is generally used for this purpose. An emulsion of oil and water, is sometimes used for special reasons.

Kinds of Wood Screws

Wood screws of many sizes and kinds may be obtained of steel or brass, but may also be obtained in nickel or blued finish. Screws are classified according to the material, finish, shape of head, length and diameter or gauge of wire from which they are made. Fig. 139 shows several screw head shapes.

The round-head screw, either blued or nickeled, is made to use on visible surfaces where the head of the screw will show. It is not countersunk, and the screw should be left in final posi-

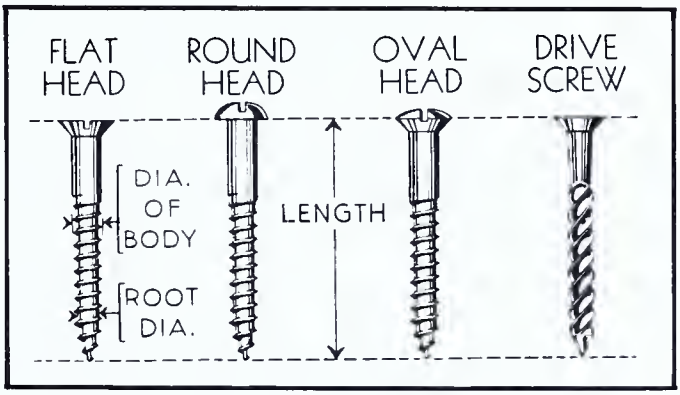


Fig. 139 — *How Length of Wood Screws Is Designated*

tion with the slot in the screw head parallel with the grain of the wood. (The blued finish on screws is obtained by dipping them in oil while they are hot.)

The oval-head screw is generally used in fastening hinges and other hardware to wood.

The flat head, bright screw (F.H.B.) is made to use where it will not show on a finished surface. It should be countersunk until the head of the screw is level or slightly below the adjoining surface. If used on a visible surface, it should be counterbored and plugged as shown in Fig. 140, "A".

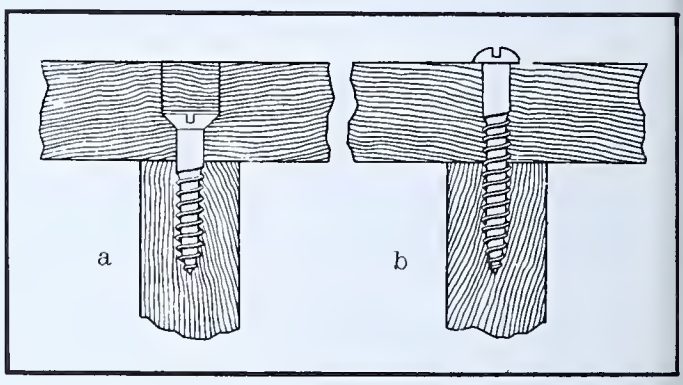


FIG. 140 — *How Flat Head Screws Are Countersunk with Auger Bit*

SIZES OF WOOD SCREWS

Screws used for general woodworking purposes range in size from No. 0 to 24. The number indicates the diameter of the screw just below the head, according to a standard wire gauge (Brown & Sharp). A No. 3 screw will be found to have a diameter of about 3/32 inches, while a No. 18 screw will be about 5/16 inches in diameter. In length, screws range from ¼" to 1 inch by eights and from 1 inch to 5 inches by fourths. The length of the flat head screw includes its over-all measure, but the length of the round-head screw does not include the head (Fig. 139).

The length of the oval-head screw includes the bottom tapered part of the head as indicated in Fig. 139. The reason for this measurement is that only the tapered part of the oval-head is set below the surface of the wood or metal.

Screws have many advantages as wood fasteners. They are more permanent than nails because they hold better. Screws can be tightened easily, and the members they hold together can be taken apart readily. They require much time and care to insert properly, and are conspicuous.

Screws are packed in pasteboard boxes, each of which contains one gross (144). On the label of the box will be found the gauge number of the screw, its length, the kind of head, and the type of screw.

REFERENCE SHEET NO. 4
HOW TO SHARPEN A PLANE IRON

PROCEDURE

A. Grinding the Plane Iron

1. Using the lever cap as a screwdriver, loosen the screw that holds the cap iron and the plane iron in place.
2. Remove the plane iron and apply to the grinding wheel with its bevel turned down (Fig. 141). Grip the plane iron in one hand, with the thumb on the top and the index finger resting against the edge of the tool guide under the plane iron, as shown in Fig. 141.

   Lightly apply the plane iron to the wheel at first, and then inspect for proper width of bevel. As shown in Fig. 141, the bevel should be from 2 to 2½ times as wide as the thickness of the blade. When used to cut hardwood the plane iron will hold a sharp edge longer if this bevel is only as long as twice the thickness of the plane iron.

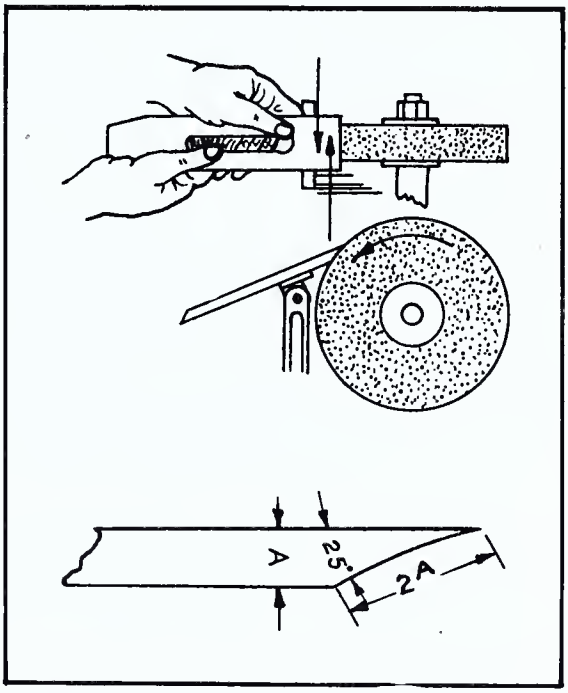


FIG. 141 — *Grinding a Plane Iron*

3. When the proper width of bevel is obtained, keep the same grip with the guide hand so that the bevel will remain uniform. Place the other hand on top of the plane iron to help guide it and work the iron from one side of the stone to the other, as shown in Fig. 141.

NOTE: When the cutting edge of the plane iron is moved from side to side across the face of the grinding wheel, care should be exercised to move the entire plane iron in a straight line with the cutting edge of the wheel. If this is not done, a rounded and incorrect cutting edge will be produced as shown in Fig. 142, B.

4. Continue grinding until the bevel reaches a cutting edge.
5. Test the edge for squareness and straightness by placing the head of a try square against the side of the plane.
6. Frequently dip the plane iron in water during the grinding.

   This will prevent the edge from turning blue, which would indicate that the temper had been drawn. If the plane iron has been ground straight and true, it will be slightly "hollow ground," as shown in Fig. 142 at "a".

7. Inspect the plane iron closely to see if a wire edge has been turned on the side opposite the bevel.
8. If a wire edge has been formed, remove it by drawing the edge lightly over a piece of wood.

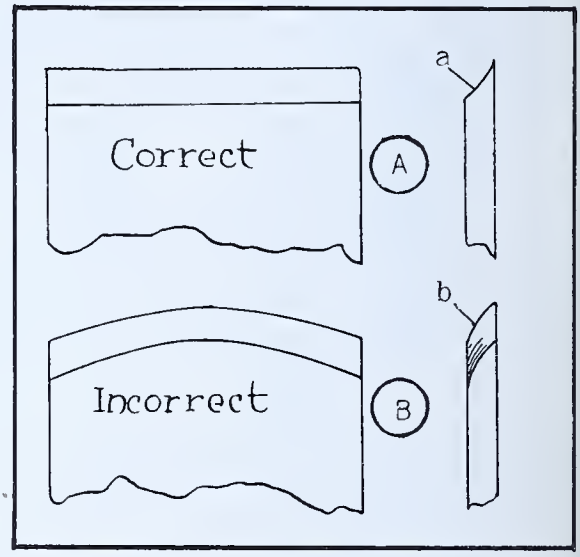


FIG. 142 — *Correct and Incorrect Edge*

B. Whetting the Plane Iron

1. Place the plane iron on an oilstone with the bevel flat on the stone.
2. Raise the back end slightly so that only the cutting edge rests on the stone (Fig. 143).
3. Hone lengthwise of the hone, being careful not to let the plane iron slip off at either end.

   NOTE: If preferred, a circular motion (Fig. 143) may be employed instead of the straight lengthwise motion.

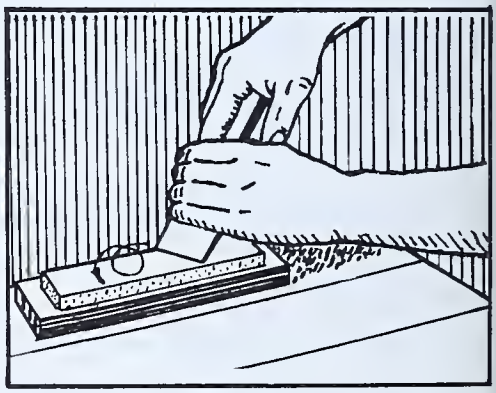


FIG. 143 — *Use Circular Motion*

4. Remove the sharp corners of the plane iron by giving them a light stroke on the stone.
5. Now turn the plane iron over on the stone with its bevel side up, and lay it flat on the stone (Fig. 144).
6. Hone on this side until all traces of the wire edge have been removed.

7. Test the finished edge of the plane iron for sharpness by using it as a razor; try shaving hair from the arm. If the plane iron is properly sharpened it will shave readily.

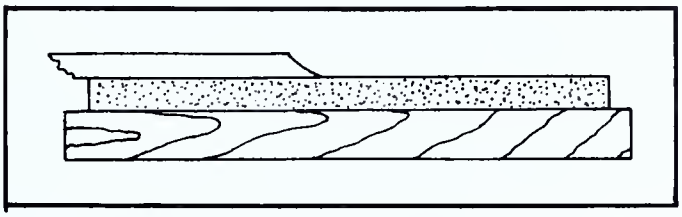


FIG. 144 — *Removing Wire Edge*

8. When the plane iron has been thoroughly sharpened and whetted, install the plane iron and the cap iron.

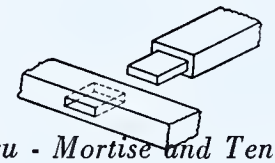
NOTE: The plane iron is sometimes given a final honing on a leather strap to give it a finer cutting edge. It is best to give the oilstone a light dressing of kerosene before whetting the plane iron. This carries off the steel particles and prevents their becoming imbedded in the stone.

REFERENCE SHEET NO. 5
COMMON WOOD JOINTS

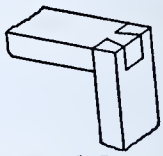
Joints fasten the various members of constructed units together. Since a joint is only as strong as its weakest part, it is important that its various parts be balanced in strength.

Following are a few of the most commonly used joints.

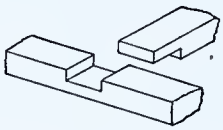
COMMON WOOD JOINTS



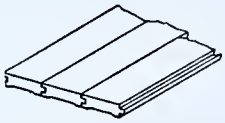
Thru - Mortise and Tenon Joint



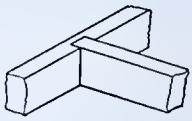
Dovetail Joint



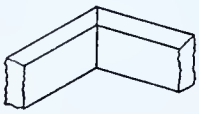
Middle Lap Joint



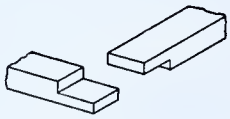
Tongue and groove Joint



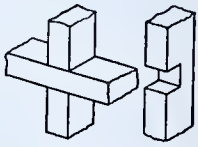
Dado Joint



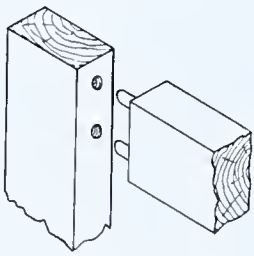
Miter Joint



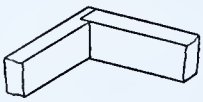
End Lap Joint



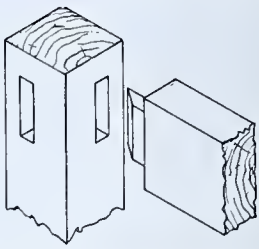
Edge Cross Lap Joint



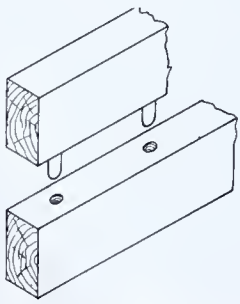
End-Doweled Joint



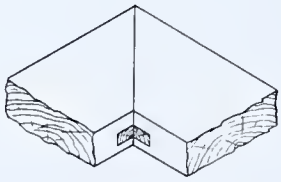
Rabbet Joint



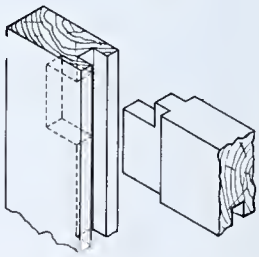
Blind Mortise and Tenon Joint



Edge-Doweled Joint



Spline Miter Joint

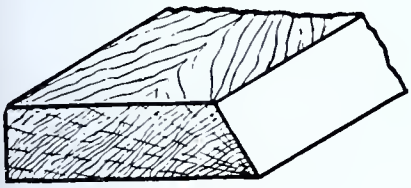


Haunched Mortise and Tenon

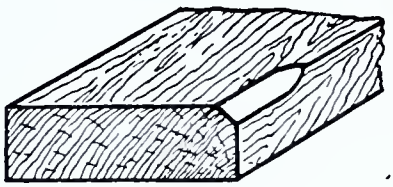
REFERENCE SHEET NO. 6
COMMON CUTS IN WOOD

In repair work, as well as in new construction a joiner must be able to make the cuts in wood normally made in this kind of work. While all of these cuts can be made with powerdriven machines, it is necessary that the ship joiner should learn to make these joints by hand. It is essential that the tools used in making these cuts be sharp and in good working order. Below are a few of the shapes of cuts most commonly used.

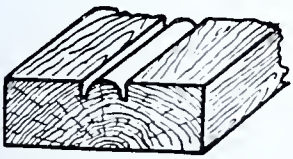
COMMON CUTS IN WOOD



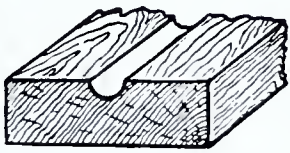
Bevel



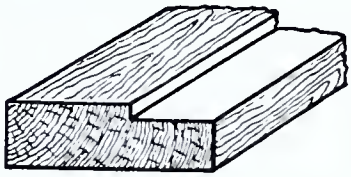
Stop Chamfer



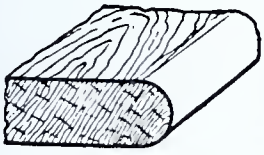
Bead



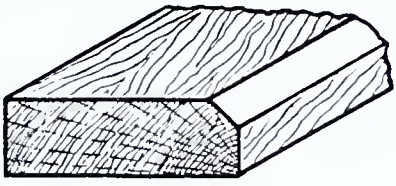
Hollow



Rabbet



Nosing



Chamfer

Quarter Round

REFERENCE SHEET NO. 7
LOCKS AND KEYS

Two general types of locks are used on a ship, a rim lock in which a bit key is used, and a mortise lock with a cylinder attachment which takes a yale-type key. Consult the drawing detail for the location of these locks.

Locks are made in four different types: namely, Right-hand regular, Left-hand regular, Right-hand reverse, and Left-hand reverse. See diagram below.

You can tell the "hand" of the lock by the way the door hinges as you stand in the passageway facing the door. See Fig. 145. In the case of the bathroom or wardrobe door the room becomes the passage.

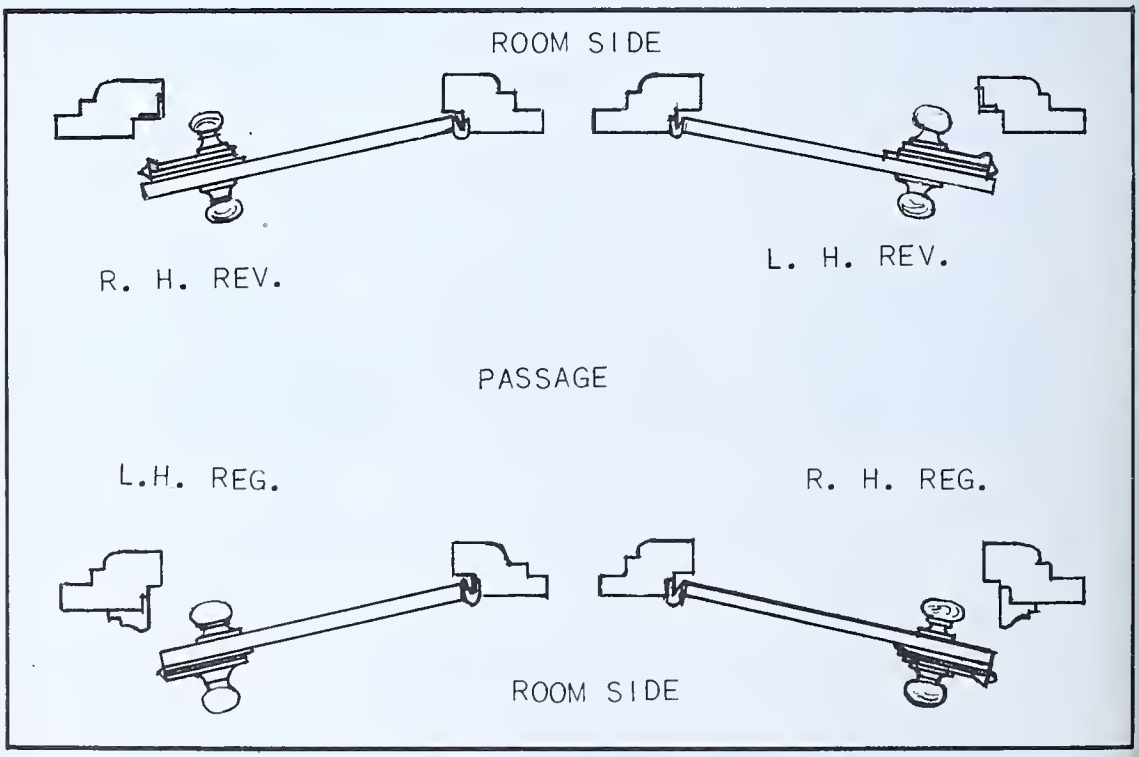


FIG. 145 — *Identification of "Hand of the Lock"*

The keys for each room are made up on key rings in the shop and then tried on the ship; at the same time any adjustment necessary to the lock or the keeper is made.

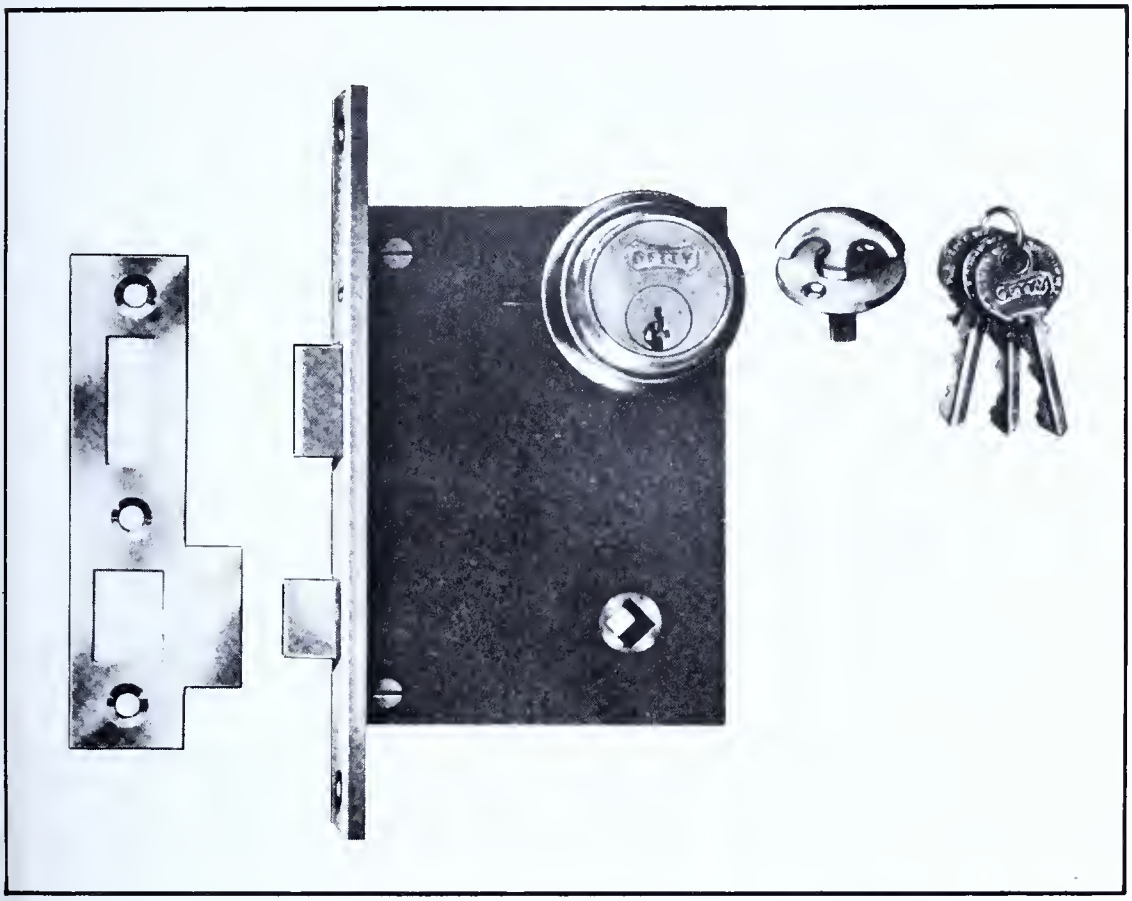


FIG. 146 — *Conventional Mortise Lock*

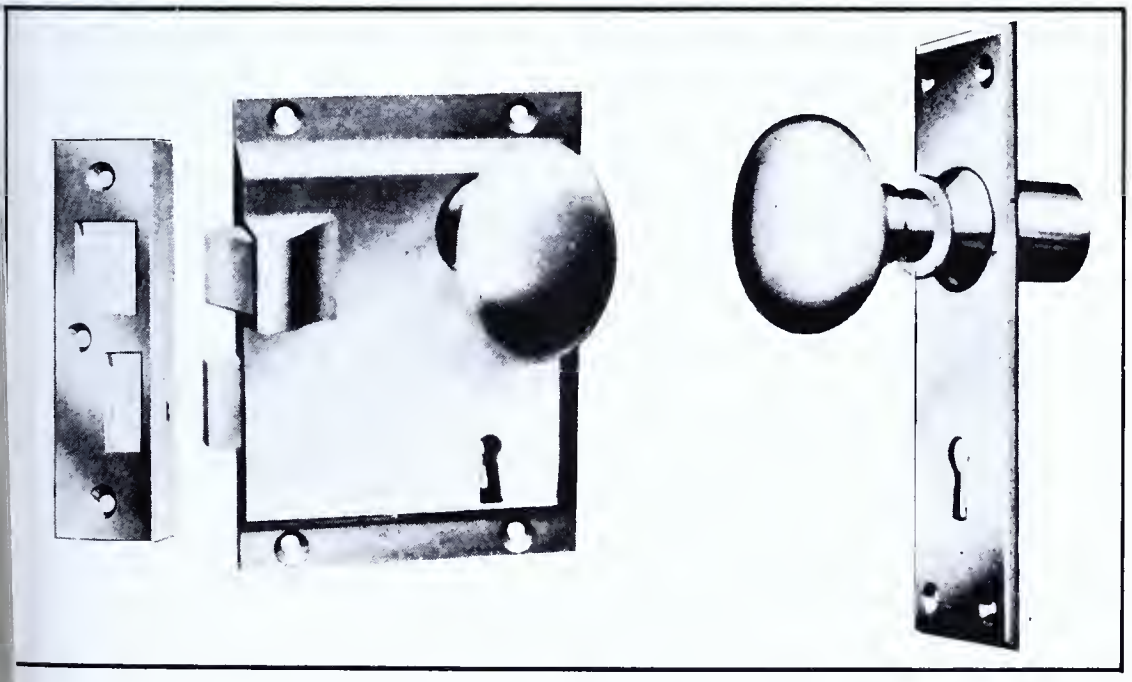


FIG. 147 — *Conventional Rim Lock Set*

REFERENCE SHEET NO. 8
DRILL SIZES FOR SHAKEPROOF SELF-TAPPING SCREWS AND FOR SHEET-METAL SCREWS

Screws	Type of Metal	Size of Drill	No. of Drill
No. 4 Parker	Light	3/32	No. 44
	Heavy	*7/64*	No. 40
No. 6 Parker	Light	7/64	No. 40
	Heavy	*1/.8*	No. 36
No. 8 Parker	Light	9/64	No. 33
	Heavy	*5/32*	No. 30
No. 10 Parker	Light	5/32	No. 30
	Heavy	*11/64*	No. 25
No. 14 Parker	Light	13/64	No. 15
	Heavy	*7/32*	No. 9
No. 4 Shakeproof	Light	3/32	No. 44
	Heavy	*7/64*	No. 38
No. 6 Shakeproof	Light	*7/64*	No. 38
	Heavy	1/8	No. 30
No. 8 Shakeproof	Light	*1/8*	No. 32
	Heavy	9/64	No. 24
No. 10 Shakeproof	Light	5/32	No. 27
	Heavy	*11/64*	No. 17
No. 14 Shakeproof	Light	13/64	No. 13
	Heavy	*7/64*	No. 9

Tables	Drill 5/16 Tap 3/8
Chairs	Drill 7/32 Tap 1/4
Crew Doors	" " " "
Outside Doors	" " " "

— Denotes the drill most commonly used.

REFERENCE SHEET NO. 9
DECKING SHORES

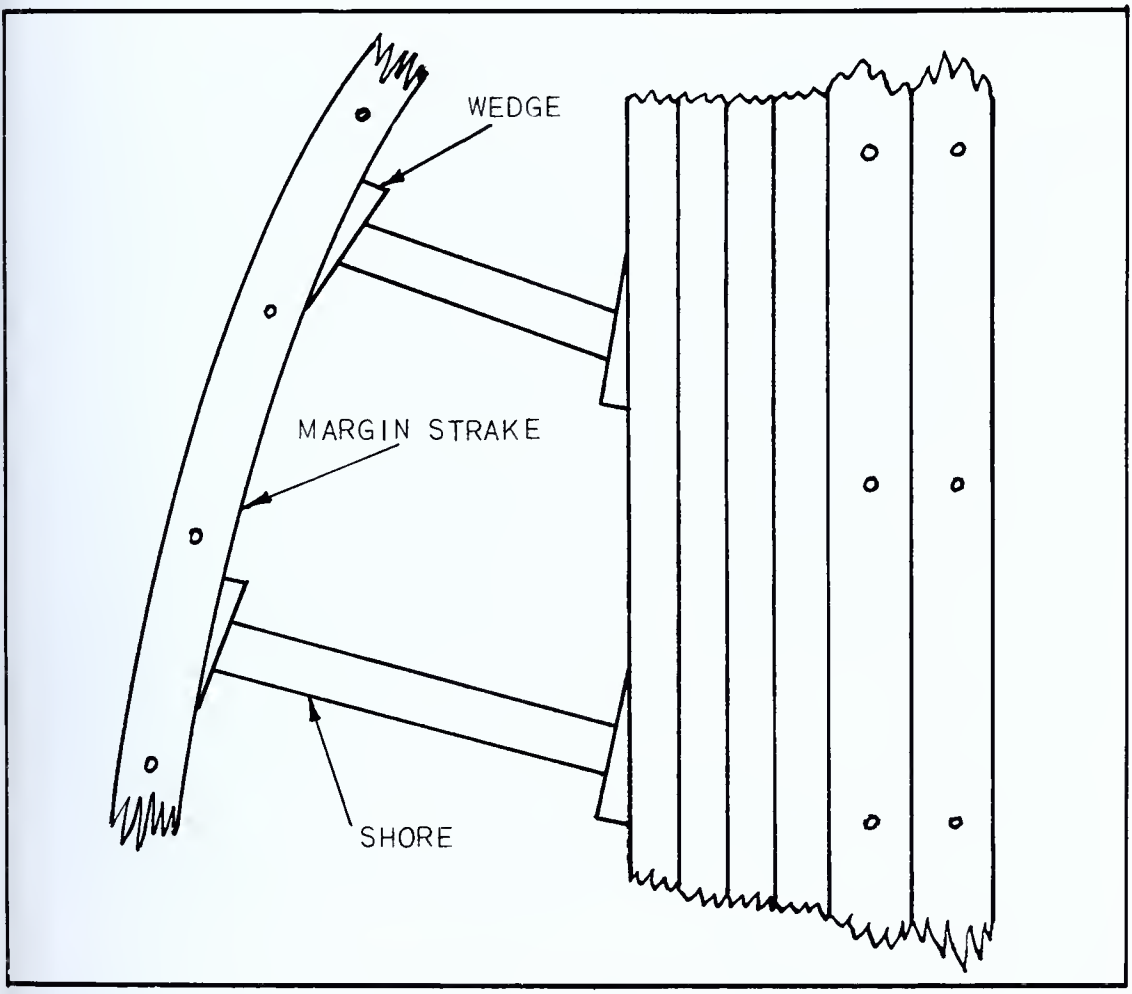


FIG. 148 — *Shoring Decking*

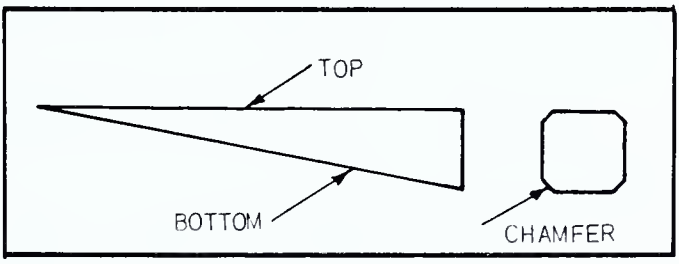


FIG. 149 — *Decking Shore Wedge*

Decking shores are cut square and to the proper length. It is very important to get the proper length since the length will determine the position of the shores. The wedges to raise the shores must be set right. A wedge has a top and bottom side. On the top side of a wedge the grain runs straight. On the bottom side the grain is cross grain. The top side of the wedge is always placed against the shore. If this is not done the wedge will split after a few blows with the maul. All wedges should be chamfered. See Figure 149.

Part VI
LOCATION OF UNITS OF A SHIP

In that the ship joiner primarily is concerned with the placing of intermediate bulkheads that close in rooms and passageways in their predetermined positions, it is important that the ship joiner become familiar with the location of the different units of a ship and be capable of determining these locations from blueprints.

The intermediate bulkheads with which the ship joiner is concerned are the ones found in the quarters used to form rooms and passageways.

Shipbuilding terms and definitions appear in Appendix I — Glossary.

The shell plating of a ship is its outside surface or covering from, and including, the flat keel outward and up the side to the level of the deck, and from end to end of the ship. This shell plating forms the ship's watertight covering which makes it float.

Bulkheads give the ship contour, shape, rigidity, and strength. They serve to separate the tanks and divide the ship into separate tanks or watertight compartments. These bulkheads are defined as transverse center-tank bulkheads, transverse wing-tank bulkheads, and longitudinal bulkheads. All transverse bulkheads extend athwartship while all longitudinal bulkheads extend lengthwise of the ship. In Fig. 151, the deck plan view of a tanker, we find the bulkheads marked by the dashed lines, and the transverse bulkheads are easily distinguished from the longitudinal bulkheads. The cargo tanks are numbered from No. 1 to No. 9 in numerical order beginning at the forward cofferdam (Fig. 150) and proceeding aft to the after cofferdam. Each of these cross-section tanks is divided into three parts; one wing-tank port side, one center cargo tank, and one wing-tank starboard side; forming in all a total of twenty-seven cargo-carrying tanks, each separated from the other by a watertight or oiltight bulkhead.

The forward and after cofferdams are placed between the oil (inflammable) cargo and the dry compartments to form an air seal, or safety compartment, between the different parts of the ship.

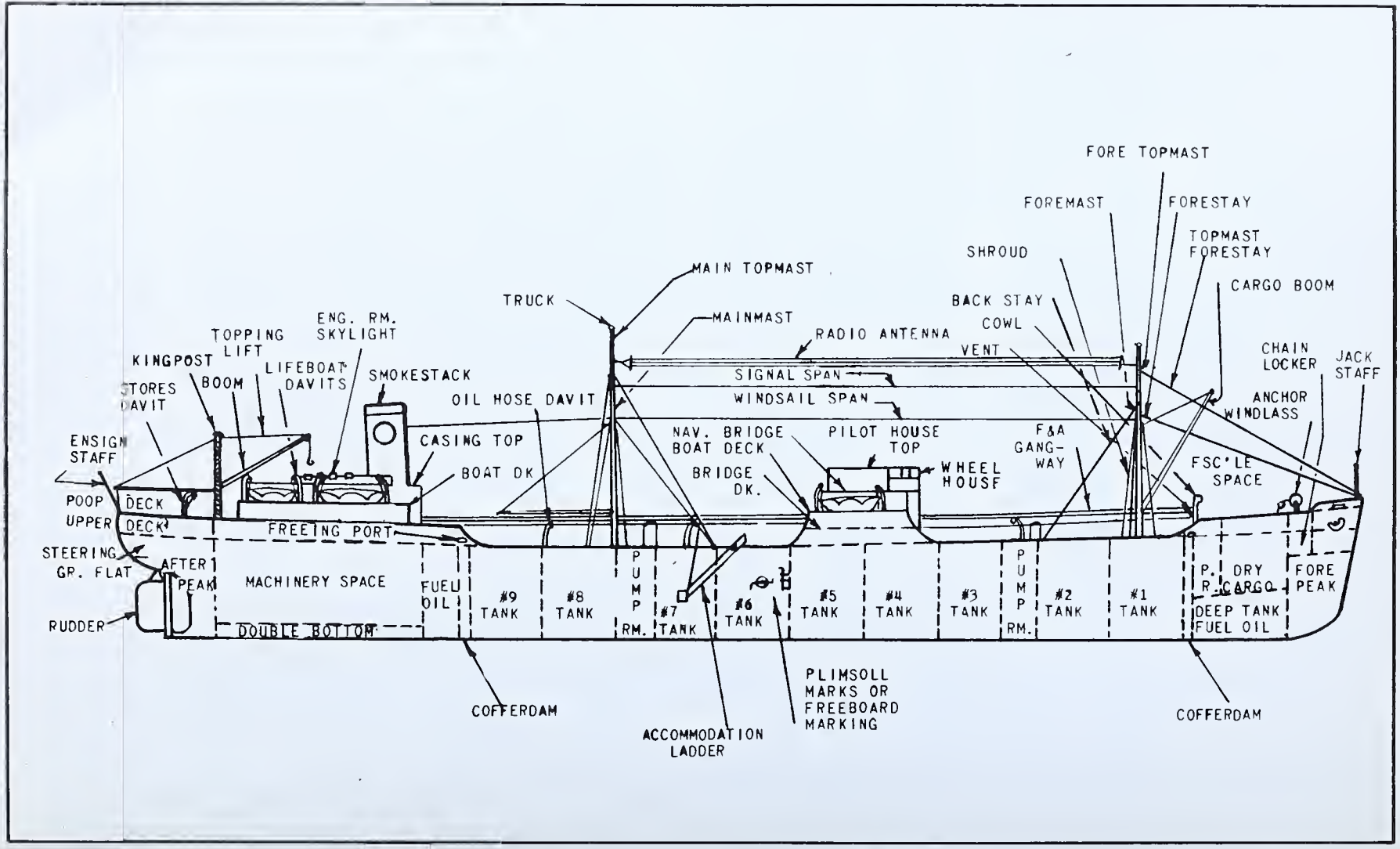


FIG. 150 — *Profile of a Tanker* (*Also, see Frontispiece*)

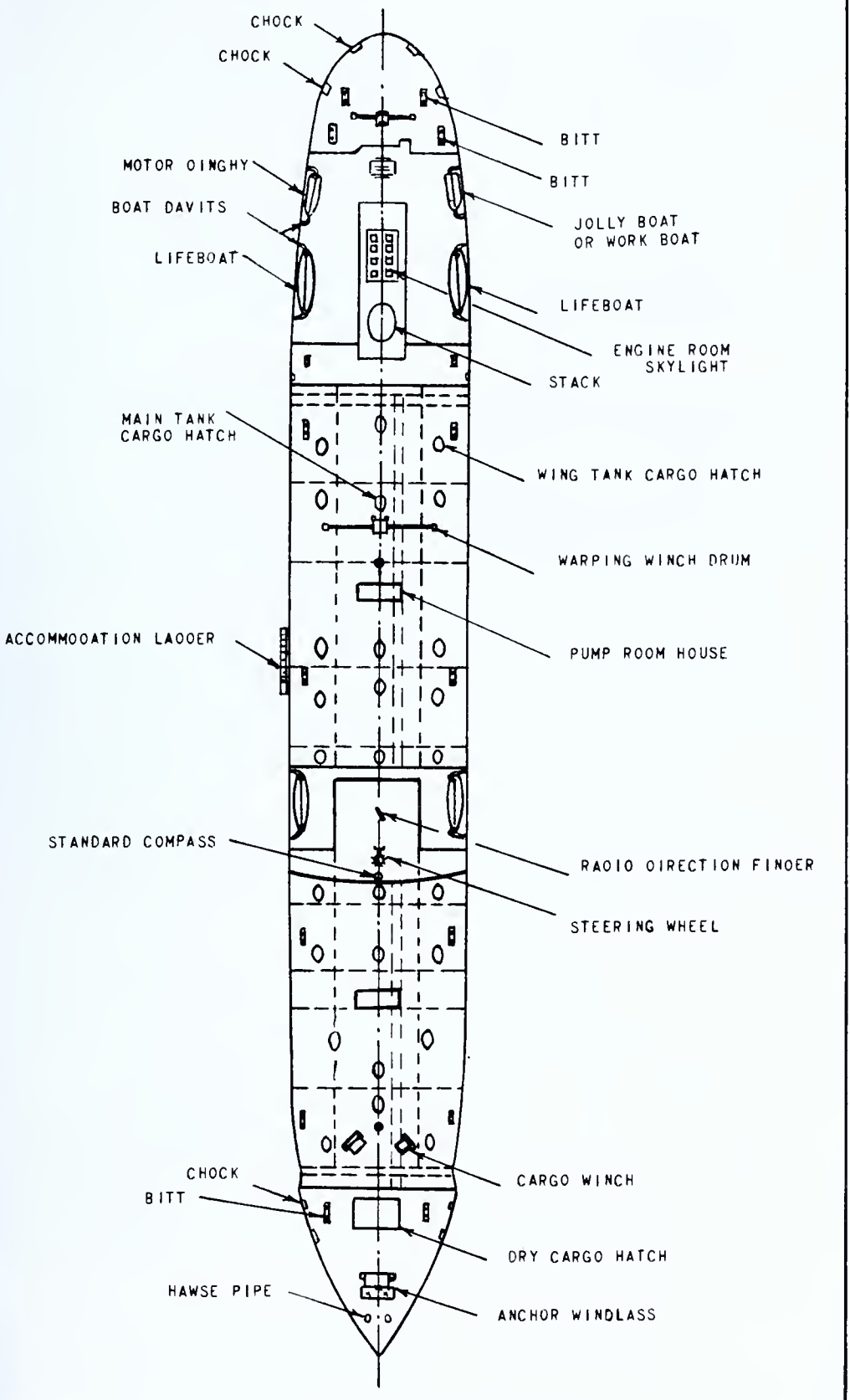


FIG. 151 — *Deck Plan View of a Tanker*

The pump rooms (one or more) are the compartments where the pumping machinery, which puts on or takes off cargo at the different ports, is confined.

Fuel oil tanks, one forward and one aft, are used for the ship's supply of fuel oil.

The dry cargo space is used for cargo or supplies that are not in a liquid form.

The chain locker, just above the forepeak, is used for storage of anchor chain.

The forepeak is a dry buoyancy space except when used as a ballast tank to level the ship.

The main deck on a tanker extends from one end of the ship to the other as indicated on Fig. 150. It is called the upper deck at the after end of the ship, and it is called the shelter deck amidships.

The forecastle deck is immediately above the shelter deck at the forward end of the ship. The bridge deck is immediately above the shelter deck amidship. See Fig. 150. The boat deck is above the bridge deck and is so called because the lifeboat stations are placed there; it is also called the upper bridge deck.

Above the boat deck is the navigation bridge or wheelhouse. The top of the wheelhouse is known as the housetop.

The inner bottom, or tank top, forms a large level space with heavy, strong construction which is used as a base for machinery. This double bottom space is used for storage of fresh water and, in some cases, for fuel oil tanks. It is also a safety measure in case of damage to the bottom of the ship.

The machinery space is used for propulsion machinery as well as auxiliary lighting equipment, generators, pumps, condensers, and all the other equipment necessary to operate a ship.

The after peak is used as a dry buoyancy space or as a ballast tank. Immediately above the after peak is the steering-gear flat where the steering machinery for the ship is located.

The poop deck is just above the upper deck at the after end of the ship. There is an after boat deck which is above the poop deck, and here, also, the lifeboats are stationed.

The rudder is at the stern of the ship just below the steering gear; it is used to steer the ship.

The plimsoll marks, or freeboard markings, designate the load water lines for different water and weather conditions, and are subject to regulations of insurance companies.

The deck fittings and rigging, such as smokestack, lifeboats, booms, davits, accommodation ladder, ensign staff, mainmast, topmast, forward masts, anchor windlass and anchor are not assembled by the joiner but their locations can easily be noted by referring to Fig. 150. The deck plan of a tanker is shown in Fig. 151.

Figure 152 shows the profile of a cargo ship, which, when compared to the tanker, differs considerably. The double bottom extends from the after peak bulkhead to the forepeak bulkhead. This space, which is under the tank top, is used for fresh water or fuel oil, or both.

In the cargo ship shown, the machinery space is located amidship so that when the ship is traveling light, balance can be maintained in the fore-and-aft direction. The machinery space on a tanker is not located amidship because this would necessitate the use of a shaft alley through the oil-carrying cargo tanks. On the cargo ship the shaft alley does extend from the engine room through No. 4 and No. 5 holds to the stern frame and propeller.

Most cargo ships have but five cargo holds, each separated from the other by a watertight bulkhead. These holds are not separated or divided by any longitudinal bulkheads, although they are separated by different decks, as shown in Fig. 152, the second deck just below the main deck and the third deck below the second. All of these decks are reached through the one hatch at the main deck and are used to separate and keep apart different types of cargo.

On the cargo ship the cabins, or quarters, are usually confined to the amidship houses, as shown in Fig. 152.

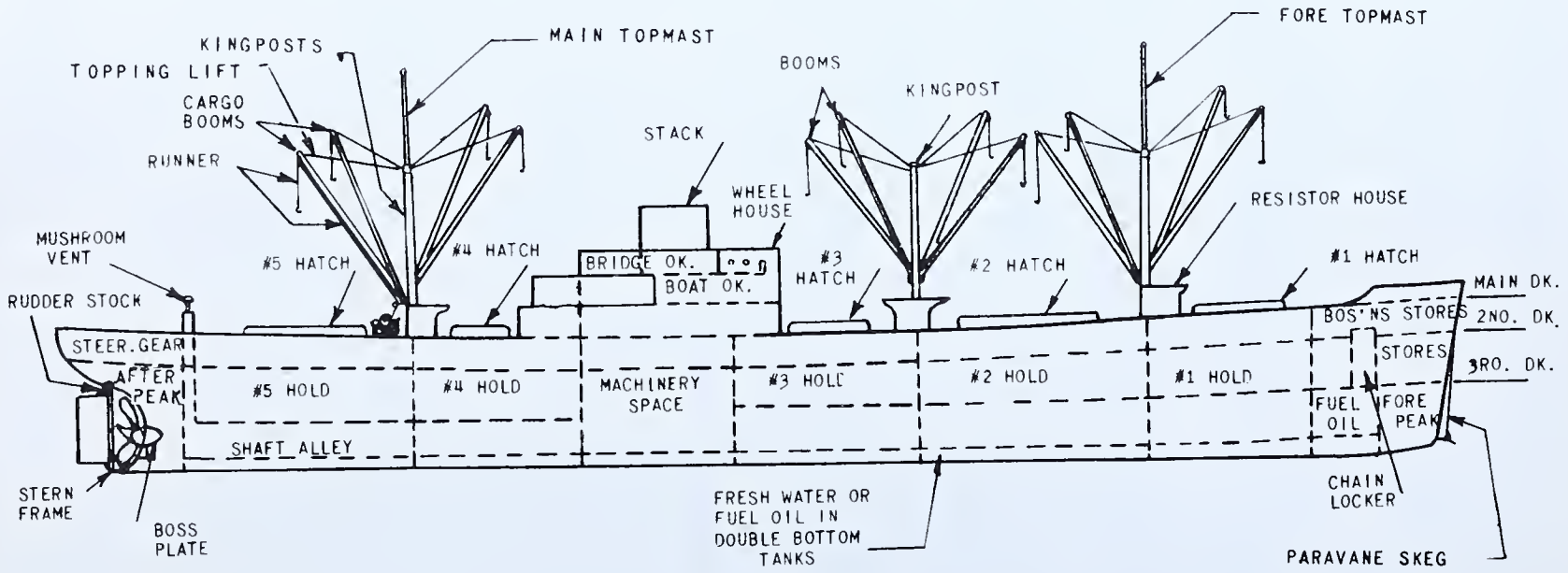


FIG. 152 — *Profile of a Cargo Ship*

QUESTIONS

1. How many cargo tanks are in the usual tanker?
2. Why is thc tanker divided into so many separate compartments?
3. Where is the forepeak of a ship?
4. What is the upper deck?
5. Where is the engine room situated on a tanker?
6. Why is the engine room amidship on a freighter?
7. In what way do the cargo holds of a freighter differ from those of a tanker?
8. Of what use is the double bottom?
9. Where is the forecastle?
10. Where is the boat deck?
11. Where is the bridge deck?
12. Where is the upper bridge deck?
13. Where is the navigating bridge deck?
14. Where is the poop deck?

Part VII
LINES OF A SHIP

Terms and Definitions Pertaining to Lines of a Ship

Every ship joiner should be familiar with the technical names denoting ship lines, surfaces, and dimensions. Familiarity with these terms is essential in reading blueprints and in building and installing parts of a ship.

LINES DRAWING — A plan showing, in three views, the molded (moulded) surface of the vessel. (See Fig. 158.)

MOLDED (MOULDED) SURFACE — The inside surface of the skin, or plating of a ship. The molded (moulded) surface has no thickness and is fair and smooth.

Actually, when the ship has been built, the thickness of the plating will extend outside of the molded surface. "Outside" strakes of plating do not touch the molded surface if they have a liner against the shell frame. The *heel* of each shell frame is in this molded surface (unless joggled). It should be remembered that this molded surface is not an actual part of the ship. It is almost exactly the shape which a thin piece of sheet rubber would take if stretched tightly over the shell frames and main deck beams with no plating in place. (See Fig. 153.)

BASE LINE — A straight horizontal line at or near the bottom of the *molded surface* from which vertical heights are measured. Usually, the base line is the very lowest part of the molded surface.

WATER LINE — The intersection of the molded surface with a horizontal plane at a given height above the base line. The six-foot water line is exactly six feet higher than the base line.

These intersections are shown in the half-breadth plan in the lines drawing. They should not be confused with the "load line" marked on the outside of a ship when built.

Ship carpenters use a water line merely as a height above the base line, and in this sense water lines are marked on bulkheads, frames, and

other members, for the purpose of properly setting and aligning the structure.

CENTER LINE — A straight line running from bow to stern, midway between the sides of the ship. All transverse horizontal dimensions are taken from the center line. The center line as applied to a transverse bulkhead is a vertical line in the middle of the ship.

BUTTOCK — The intersection of the molded surface with a vertical plane at a given distance from the center line of the ship. Buttocks are shown in the profile in the lines drawing. Fig. 158 and Fig. 159.

Ship joiners use a buttock merely as a distance from the center line. Thus, they have buttocks marked on bulkheads, decks, foundations, etc., for setting and alignment. The buttocks and the water lines which are marked on the steel members for regulating and setting are usually of some dimension expressed in even feet. That is, they would mark the 10′-0″ W. L. (Water line) and the 24′-0″ Btk. (buttock) rather than a 10′-7″ W. L. or a 23′-6″ Btk.

FRAME LINE — The intersection of the molded surface with a vertical plane perpendicular to the center line (transverse plane). Frame lines are shown in the body plan of the lines drawing. They get their name from the fact that shell "frames" or ribs usually are made to this shape and installed transversely in the ship. The lines drawing consists of three views; a half-breadth plan, a profile view, and a body plan. (See Fig. 158). These views show only one side of the ship (usually, the port side), because all dimensions for the starboard are equal and to the opposite "hand"; that is, the ship is symmetrical about the center line.

PROFILE — A view looking at the molded lines from starboard to port. (See Fig. 158). The water lines and the frame lines are straight, when observed from this direction. The deck line, or "sheer" curve, shows up clearly in the profile, which for this reason is sometimes called the sheer plan.

BODY PLAN — A view showing the shapes of the frame lines. (See Fig. 158). The body plan is made in two parts. The right-hand part is a view looking directly aft at the forward port side of the molded surface, while the left-hand part is a view looking directly forward at the after half of the port side. This arrangement prevents the frame lines at the after end

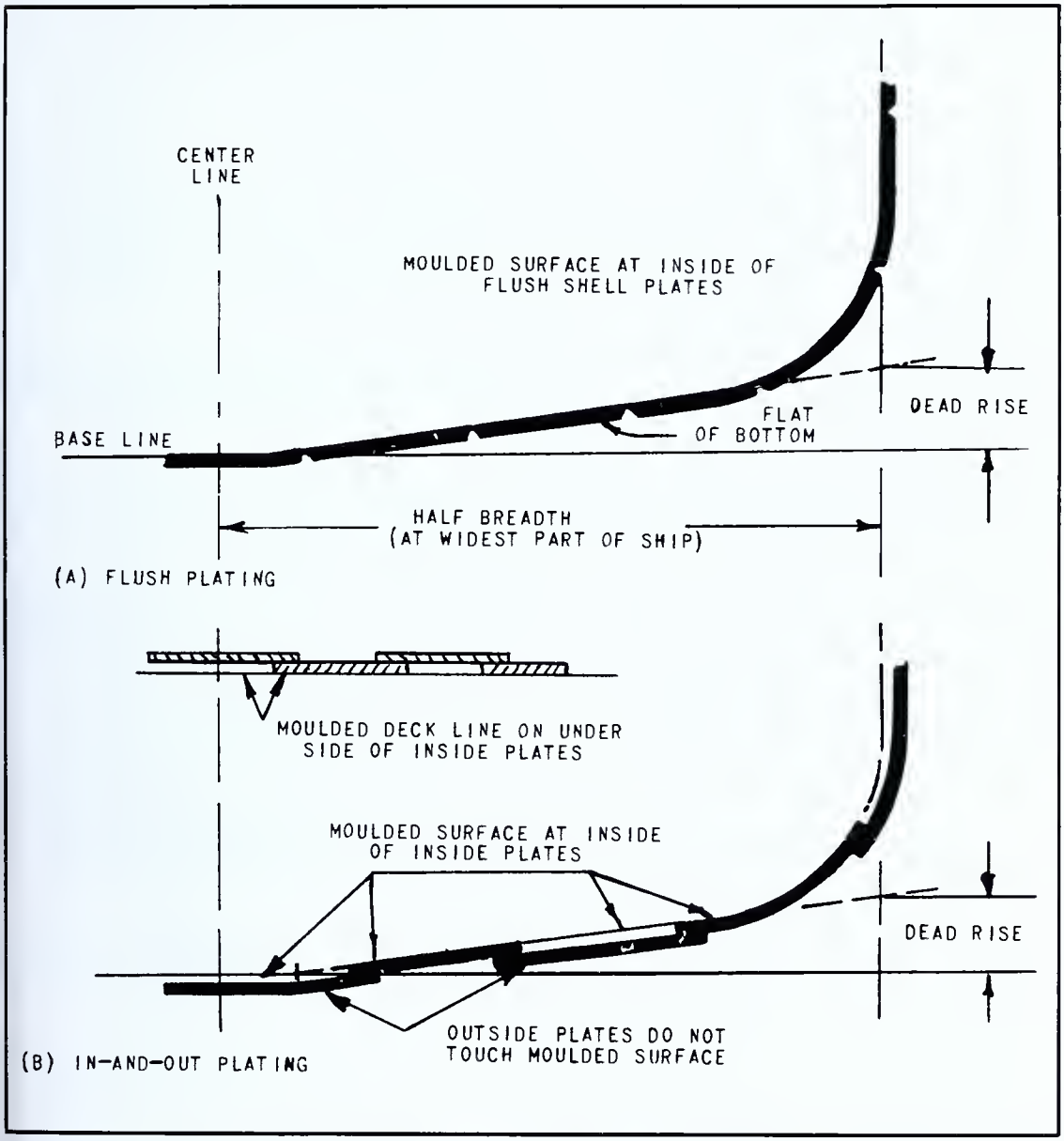


FIG. 153 — *Moulded Surface*

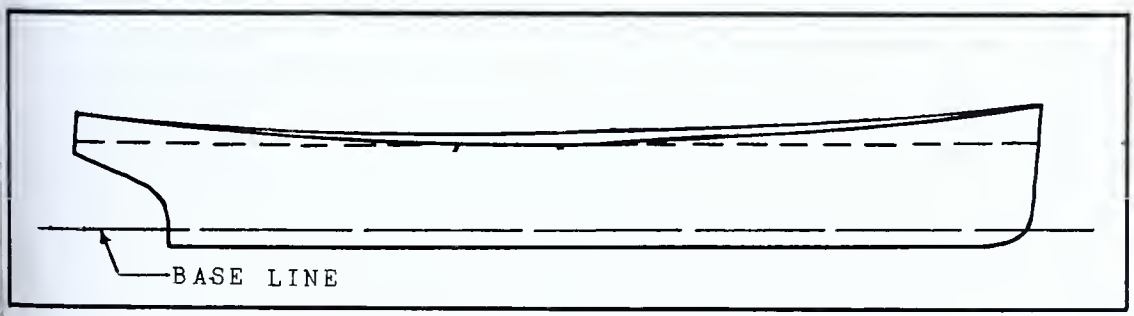


FIG. 154 — *Base Line Location*

from obliterating or fouling the frame lines at the forward end. This view shows buttocks and water lines straight, while the frame lines appear in their true shape.

HALF-BREADTH OR WATER LINE PLAN — A view looking down on the molded surface. (See Fig. 158). Here the frame lines and buttocks appear straight, while the water lines show their true shape. To save space, only the port side is shown.

LOAD WATER LINE (L. W. L.) — The water line at which the ship will float when loaded to its designed draft.

FORWARD PERPENDICULAR (F. P.) — A vertical line at the point where the load water line crosses the foremost part of the molded surface.

AFTER PERPENDICULAR (A. P.) — A vertical line usually at the after end of the rudderpost. If there is no rudderpost, it usually is taken at the center of the rudderstock.

LENGTH BETWEEN PERPENDICULARS (L. B. P.) — The distance from the forward perpendicular to the after perpendicular. To the designers, this length is very important, since upon it largely depends the amount of power needed to drive the ship.

LENGTH OVER ALL (L. O. A.) — The total length of the ship from one end to the other, including bow and stern overhangs.

MIDSHIP SECTION — A transverse section exactly halfway between the F. P. and the A. P. Almost invariably this is the widest part of the ship.

PARALLEL MIDDLE BODY — The straight part of the center of the ship where the water lines and buttocks have no curvature, that is, where all the fore-and-aft lines are parallel.

DEADRISE — The rise of the bottom. It is the difference in height between the base line and the point where the straight line through the bottom flat surface intersects the vertical line through the side of the molded surface at its widest point. (See A and B in Fig. 153; also Fig. 155.)

BEAM — The width of the ship (molded surface) at the widest point. (See Fig. 155).

DEPTH — The height of the ship at the midship section from the base line to the molded line of the deck at side (underneath).

DRAFT (Molded) — The height from the base line to the load water line.

FREEBOARD (Molded) — The difference between the molded depth and the molded draft. (It is the height of the side of the vessel which is above the water when it floats at the load water line.)

CAMBER — The curvature of the deck transversely. It is measured by the difference in height between the deck at the center and the deck at the side.

TUMBLE HOME — The amount the top of the side shell slopes back toward the center line between the point of the widest breadth and the deck at the side. (See Fig. 155).

SHEER — The curvature of the deck at the side as shown in the profile. The amount of sheer forward is the difference in height between the deck line (at the side) amidships and the deck line at the forward end. (See Fig. 156).

The amount of sheer aft is the difference in height between the deck (at the side) amidships and the deck at the after end. The line of the deck at center, in the profile, is higher than the line of the deck at the side, owing to the camber, or transverse curvature of the deck.

Figure 157 illustrates the difference in height (due to camber) at the side and the deck at the center. The camber curve, as usually designed, is a circle of very large radius, but sometimes it is made as a series of straight lines, as in Fig. 157.

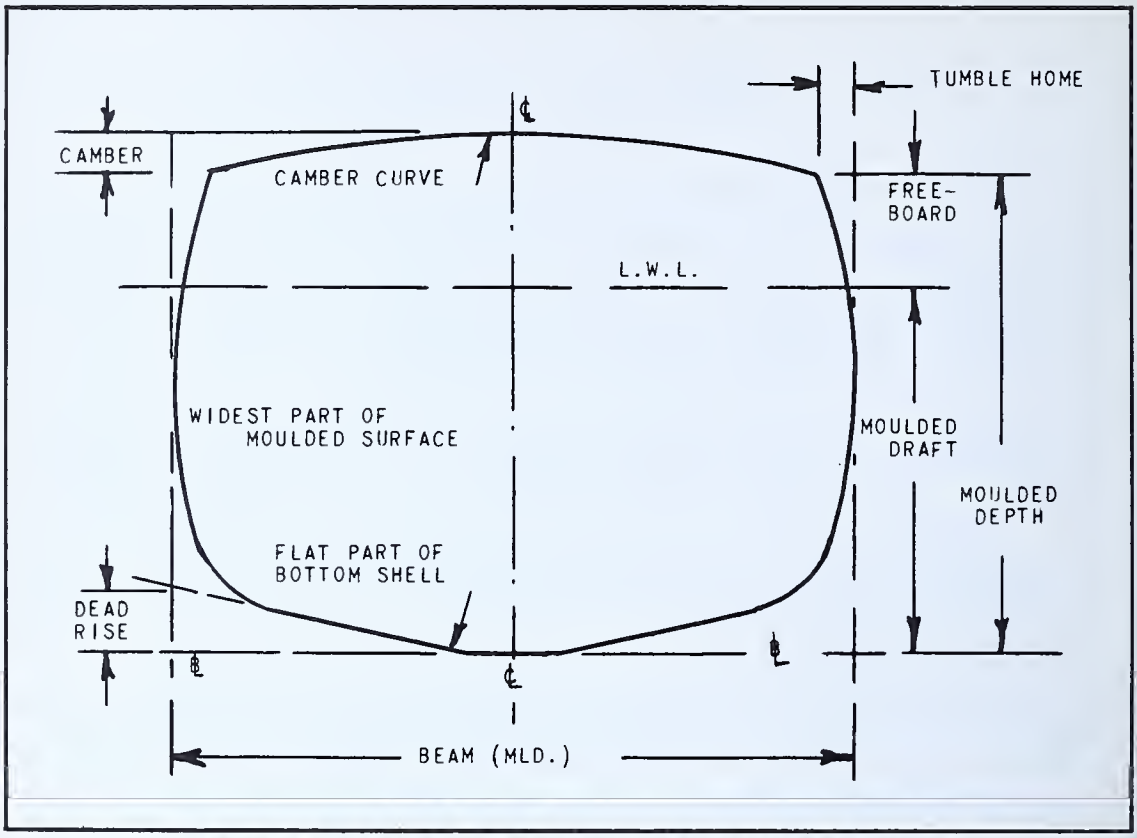


FIG. 155 — *Moulded Dimensions at Midship Section*

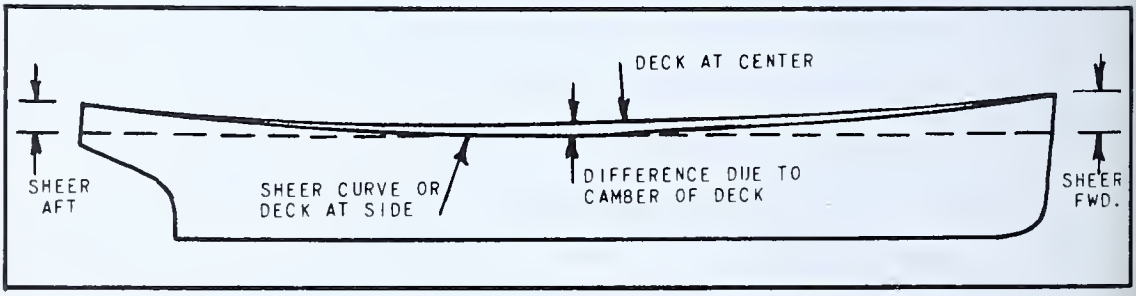


FIG. 156 — *Sheer Curve*

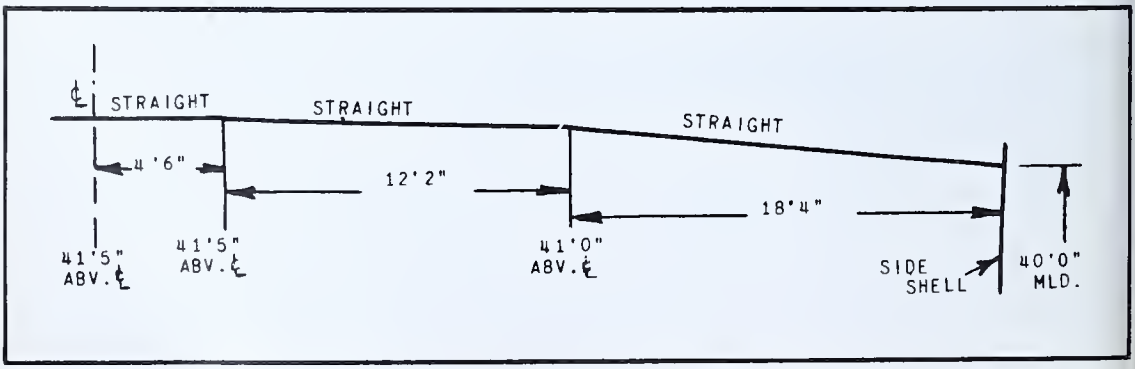


FIG. 157 — *Camber Curve (Composed of Straight Lines)*

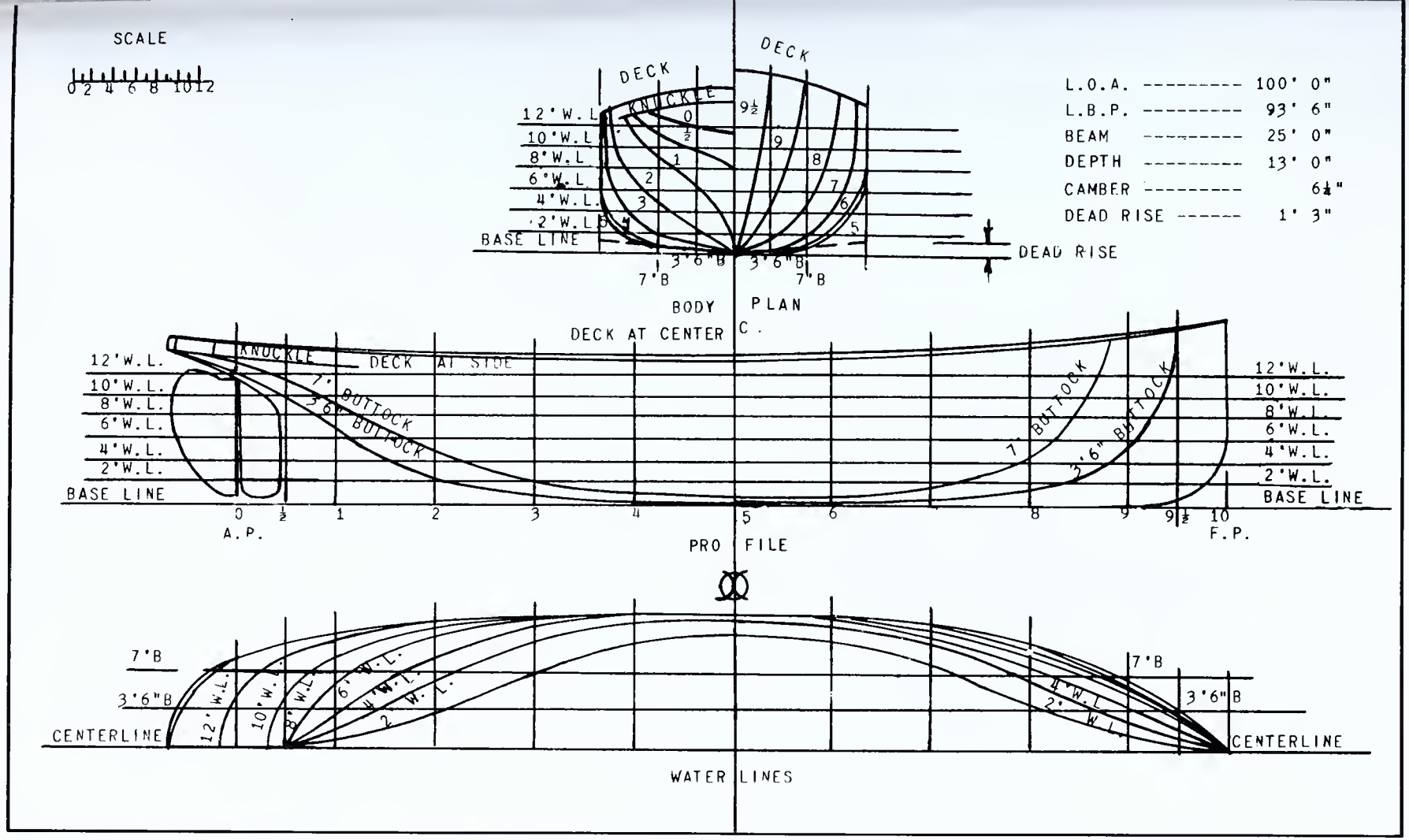


FIG. 158 — *"Lines Drawing"*

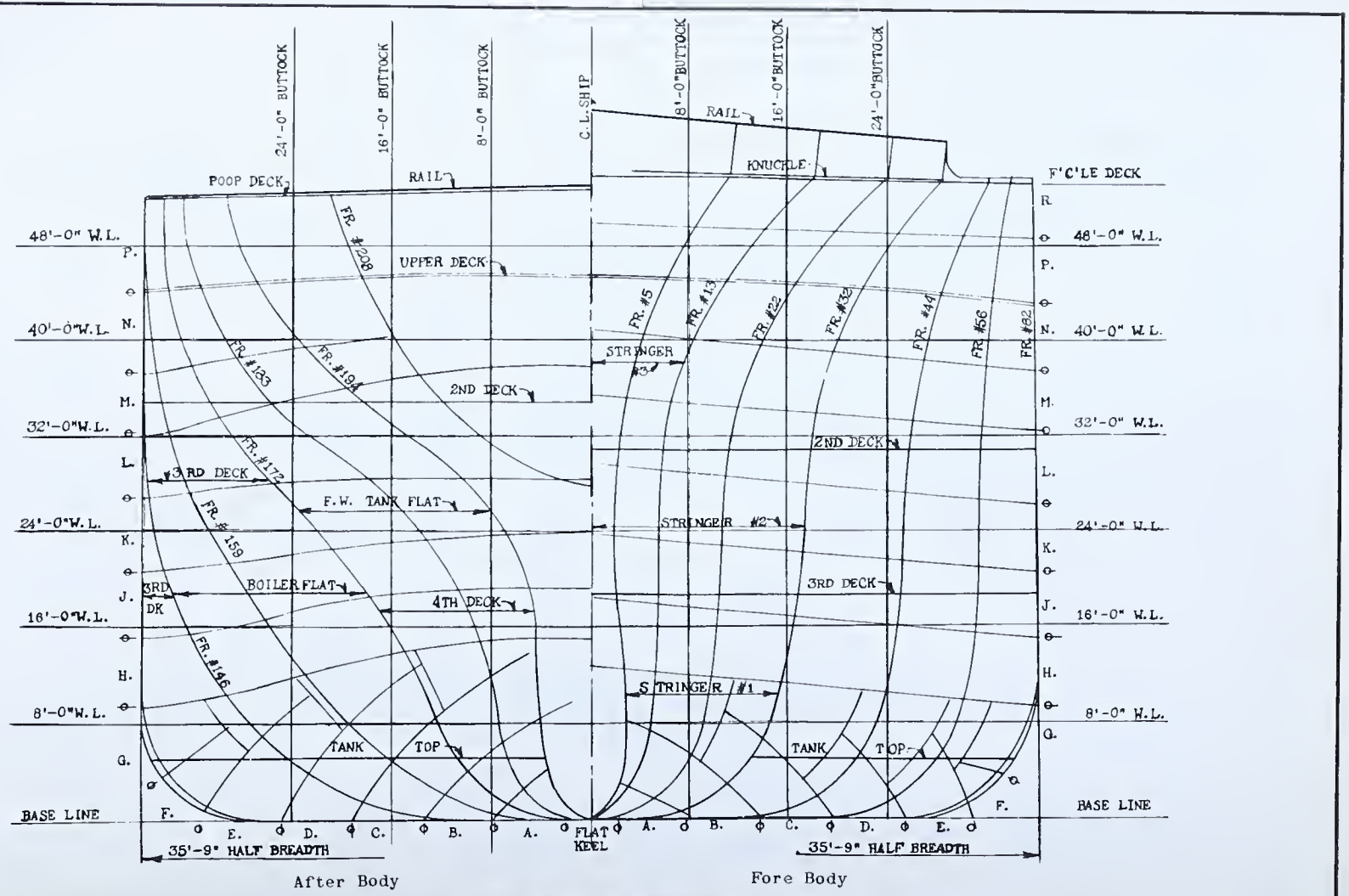


FIG. 159 — *Body Plan*

Part VIII

BLUEPRINT READING FOR SHIP JOINERS

Introduction

Blueprint reading, fundamentally, is essential for all shipbuilding trades. Ships are designed by engineers in every detail and draftsmen express these details on paper in the form of working drawings. From these working drawings blueprints are made, supplying the necessary information which enables the workmen in the yard to do their particular jobs. The mold loftsmen lay out and construct templates by referring to these prints. In like manner the duplicators, shop shipfitters, erectors, shipfitters, joiners, and others, depend upon the information on blueprints to do their part in building a ship.

A blueprint may be thought of as the universal language of shipbuilders. It is a ready reference at all times acting as a guide for the mechanics within the industry. The blueprint, therefore, is a form of abbreviated language; it is a shorthand method for conveying exact, detailed information. The working drawing, by means of symbols, abbreviations, and lines, conveys information which would require many pages of manuscript.

The reading of a blueprint is essential in the daily work of the joiner. Without a knowledge of how to read a blueprint he could not successfully perform his work.

CONVENTIONAL LINES USED ON SHIP HULL DRAWINGS

A knowledge of the kinds and weights of lines used in ship joinery blueprints is essential. An understanding of these lines will enable you to read and interpret a blueprint.

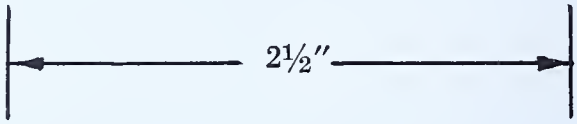
Border lines are heavy, full lines used as a border or as margin lines for drawing.

Object lines or visible edge lines are full lines somewhat lighter in weight than border lines.

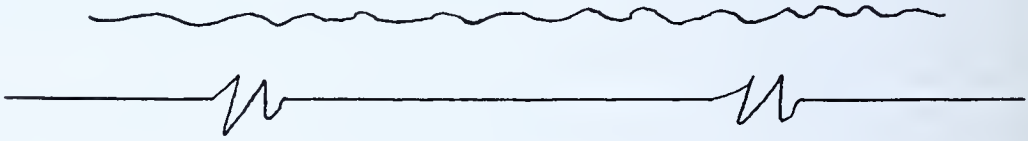
Invisible edges are represented by short dashes and are of medium weight lines.

Center lines are alternating light, long lines and short dashes.

Dimension lines are light, full lines drawn parallel to the direction of measurement with small arrowheads on each end, divided at some point to allow insertion of dimensions.



Broken lines to represent breaks in a member are of two types and are the same weight as object lines.

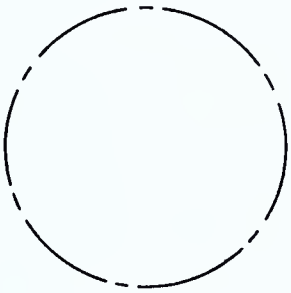


Invisible edges that are away from the plate or member are represented somewhat like a center line although the long lines are shorter than those of the center line.

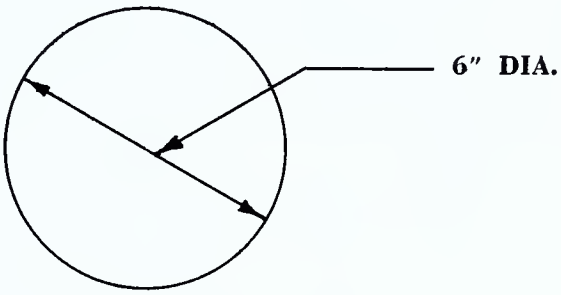
Invisible plate edges are represented by a heavy dashed line with light, solid lines on either side.

Section lines, which may be either light, full lines, or long uniform dashes, show the point at which a section is taken; the direction of the view is shown by the short lines terminating in arrowheads.

A detail line is usually a broken line, or a long line and dash of medium weight.



Reference lines are light, full lines generally oblique (slanting) used to point out special features on a drawing.



VIEWS

When describing an object in the mechanic's language, a drawing is used. This drawing is usually a series of illustrations of how the object would appear from various selected positions. The term "view" is used to describe what we would see or view from one of these positions. If we view the object from directly above, we say we have a top view or *plan view.* From the right side we would have a *right side view,* or elevation, and from the near side or directly in front — a *front view,* or *elevation,* and so on. With the front view as the key view, the views assume their names from the position in which we imagine ourselves to be as we look at an object. See Figure 160.

The reading or making of blueprints requires the ability to visualize. For present purposes this will mean the ability to see in your mind's eye the appearance of an object from different positions without you yourself

moving or changing your position. Figure 161 shows the object pictured in Fig. 160 as we would visualize it from different positions.

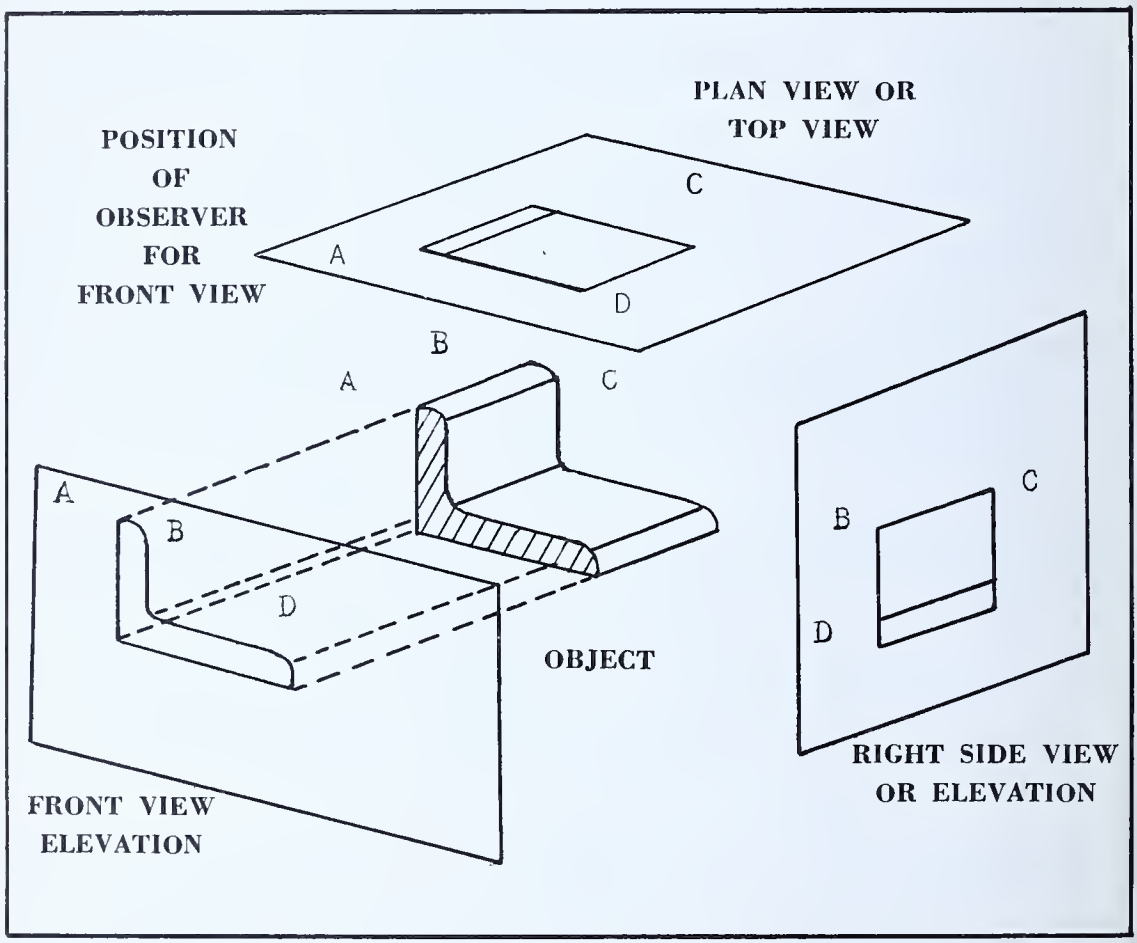


Fig. 160

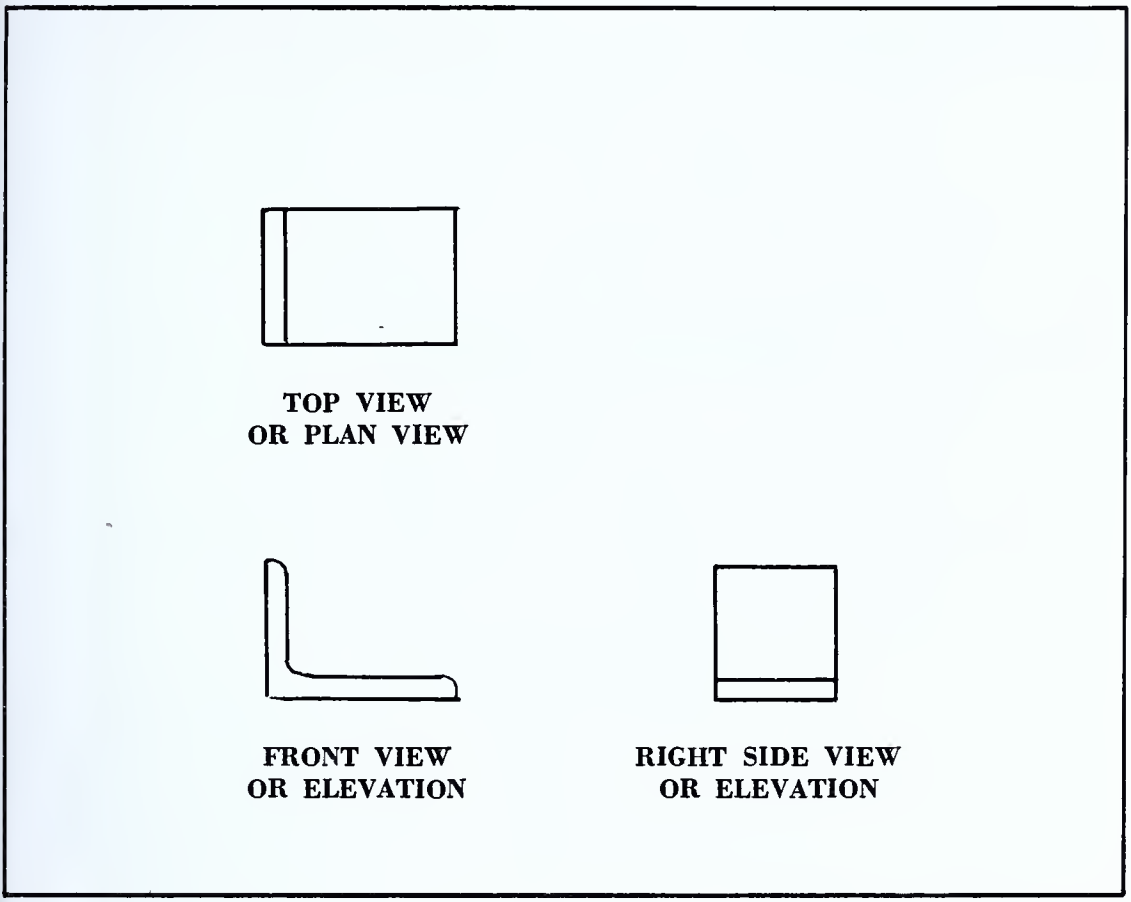


FIG. 161

VISUALIZATION PRACTICE

To the right is given the picture of a simple object. If you can successfully sketch this you have visualization ability and should be able, after further study, to read blueprints. See Figure 160 of this unit to determine the direction from which you must look for the views wanted.

Using a separate sheet of paper, make a three-view sketch of Fig. 162, placing the views so as to conform to standard practice.

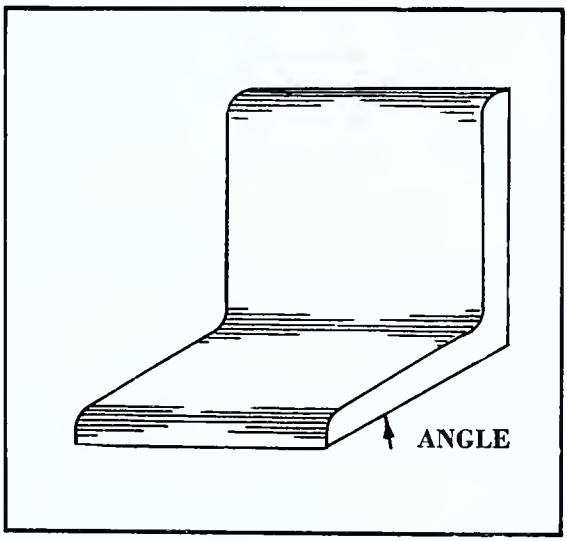
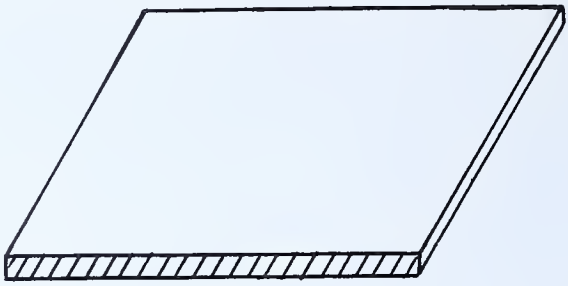
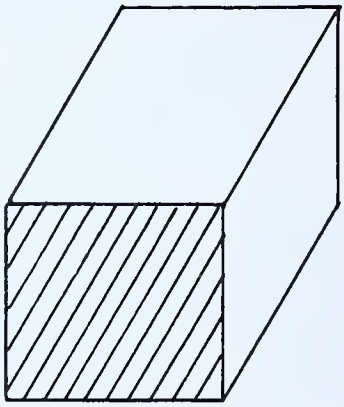


FIG. 162

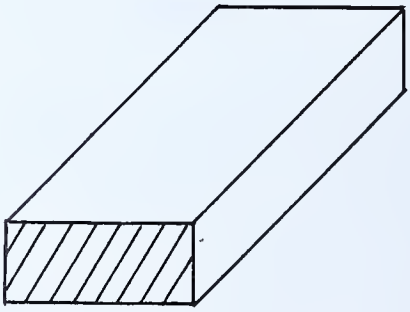
Using a separate sheet of paper, sketch three views of the objects that follow, placing them so as to conform to standard practice.



PLATE



SQUARE BAR



FLAT BAR

RELATION OF VIEWS

In order to show clearly the shape of an object, more than one view must be drawn. Any views may be represented, depending on the peculiarity of the object. However, the top, front, and right side views are considered to be a more-or-less standard combination. See Fig. 161.

The views of an object must have a definite relation to each other. They are not drawn haphazardly. This relation or orderly arrangement of views is absolutely necessary if the views are to be interpreted clearly.

Figure 163 is a picture drawing of a short piece of angle, suspended in a glass box. Figure 164 shows the same glass box with the top raised up in line with the front, and the right side pulled forward in line with the front. If one looks down on the top view in Fig. 163, one will see the outline shown in the top view of Fig. 164. If one looks into the front view side of Fig. 163, one will see the outline shown in the front view Fig. 164. The right side views are arranged in the same way. Note that the three views line up with each other. This is the correct relationship and alignment. They need no labels in Fig. 165. The box has been removed and the shading has been eliminated in Fig. 165. The use of a model will assist in visualizing the correct relationship of the three views.

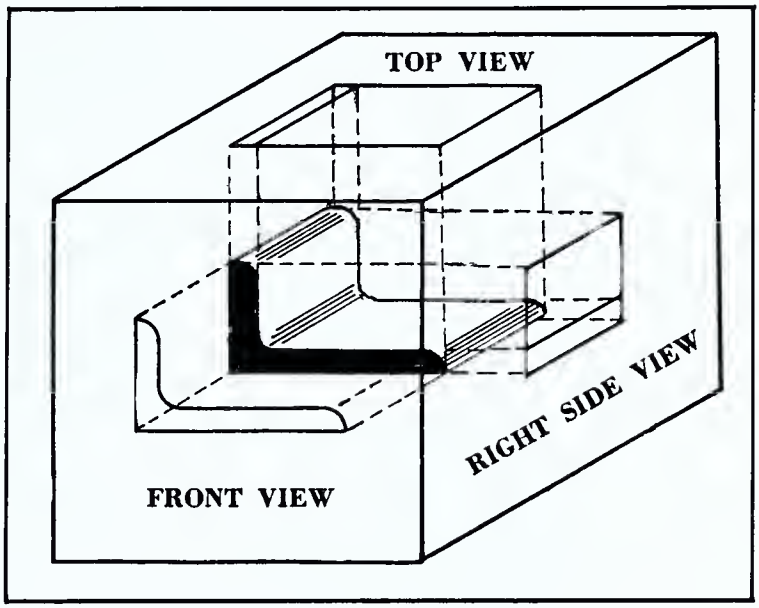


FIG. 163

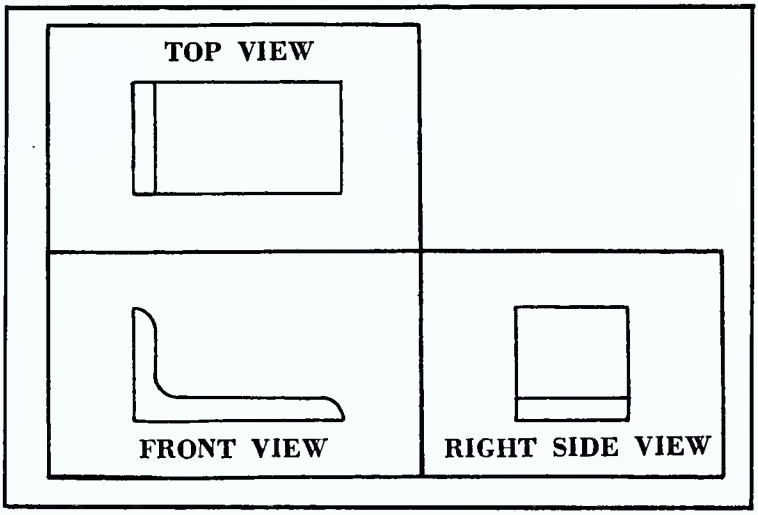


FIG. 164

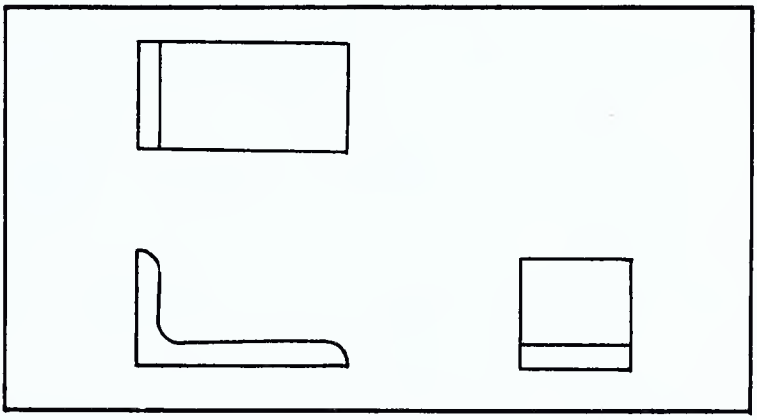


FIG. 165

PROJECTION

Study Fig. 166 thoroughly. Compare the picture in the upper left-hand corner with the three views below it. Corner "D" in the picture is located at corner "D" in the center view of the three-view drawing. "A", "B", and "C" corners are shown in the picture and in the three views. Compare the letters at the right of Fig. 166 with the letters on the picture and drawing. Use a model to clearly bring out the meaning. The dotted lines in the three-view drawing show the path of projection.

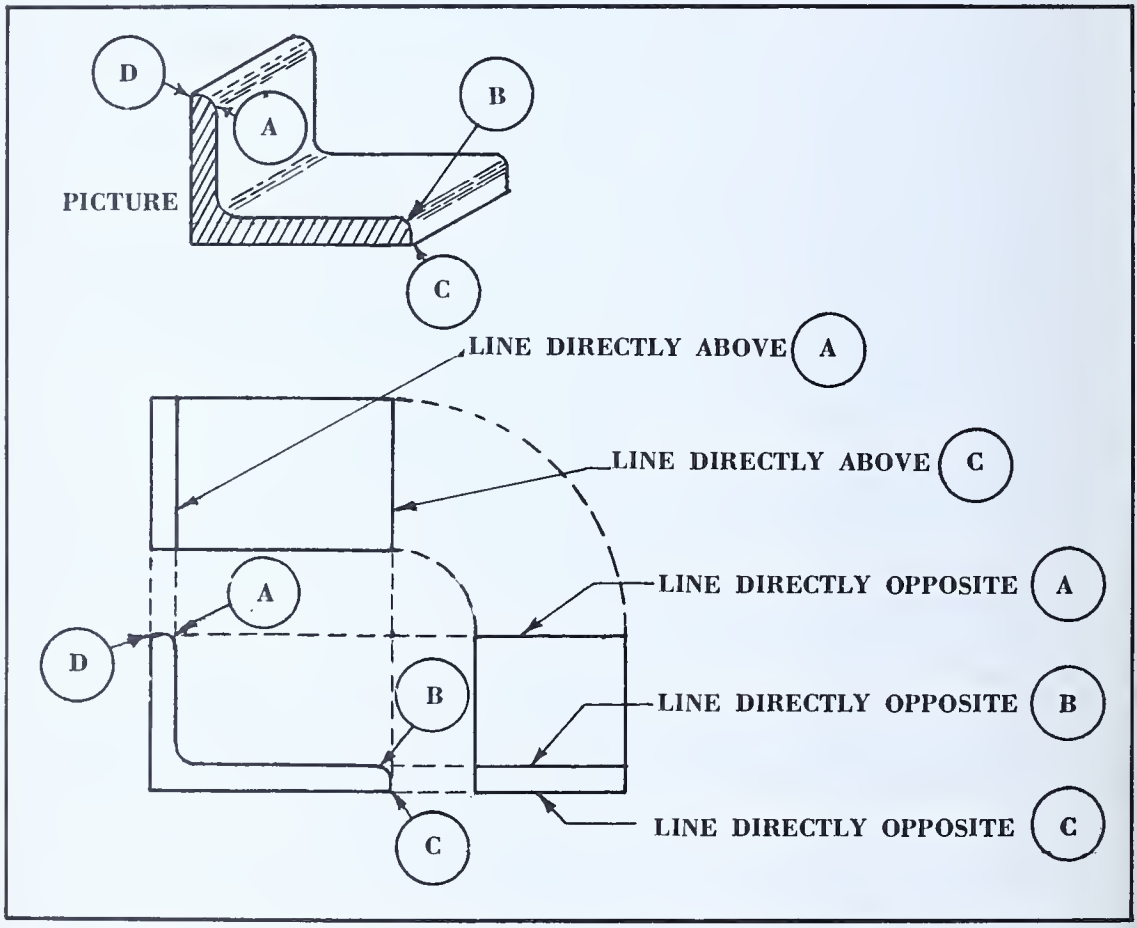
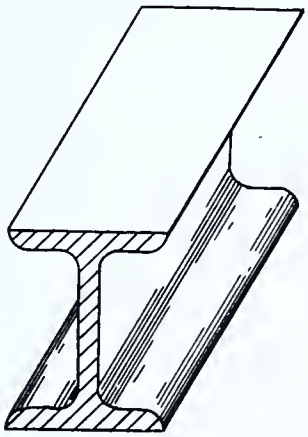


Fig. 166 — *Showing Relation of Views and Parts of Views*

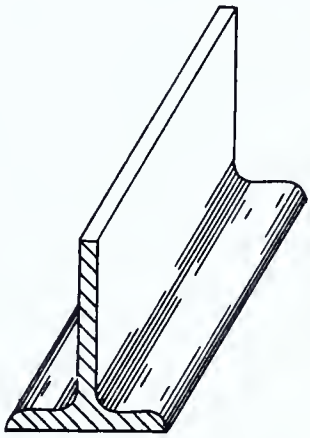
BASIC RELATIONSHIPS

1. All parts of the front view are just as long as corresponding parts of the top view.
2. All parts of the end view are just as wide as corresponding parts of the top view.
3. All parts of the front view are just as high as corresponding parts of the end view.

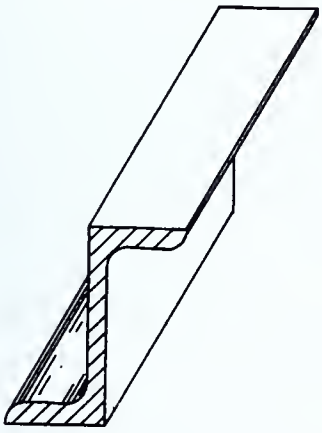
Using a separate sheet of paper, sketch three views of the objects that follow, placing them so as to conform to standard practice.



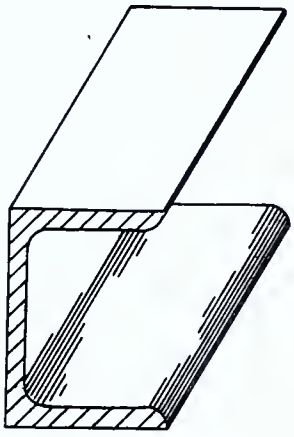
I BEAM



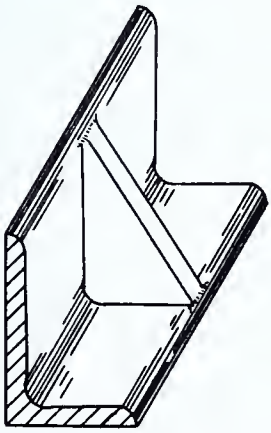
TEE BAR



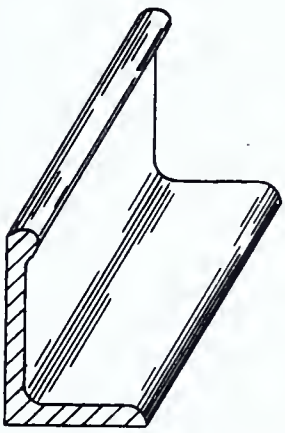
Z BAR



CHANNEL BAR



ANGLE BAR AND BRACKET



BULB ANGLE

INVISIBLE EDGES

Dotted lines indicate that certain outlines are hidden behind some part of the object shown in the drawing. Imagination must be used to visualize the shape when reading blueprints which have dotted lines. The view "A", Fig. 167, is the top of view "B", when looking down on "B" in the direction shown by arrow "X". View "C" is the right-hand side of "B" when looking at "B" in the direction of arrow "Y". Place a scale across the dotted lines and

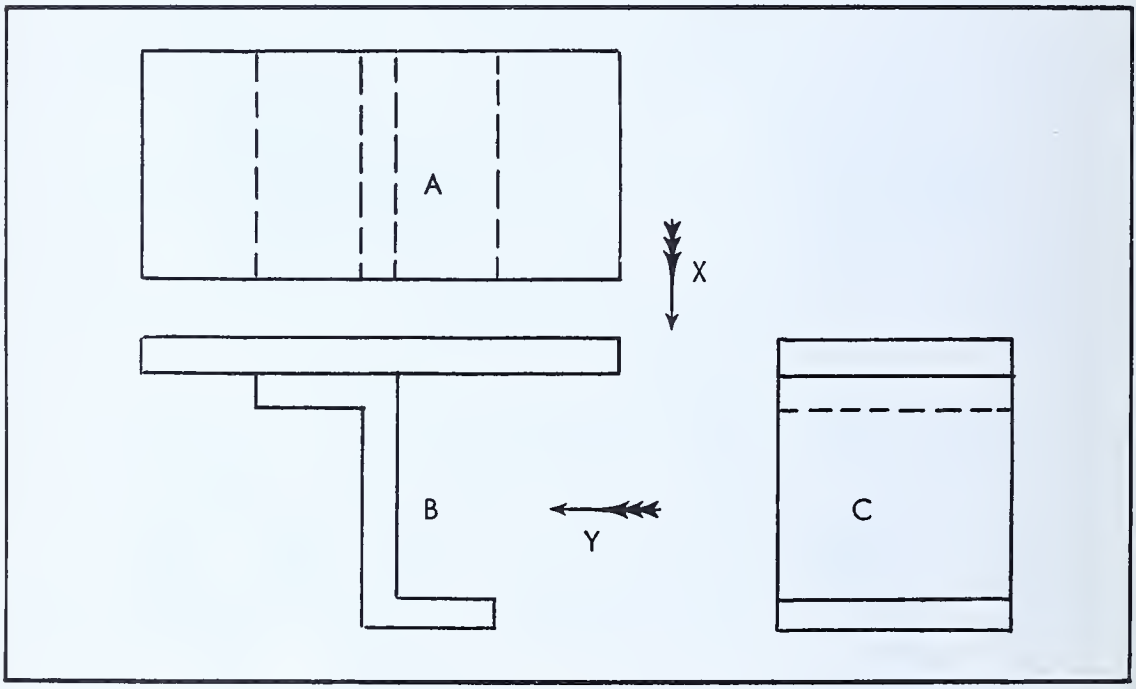


FIG. 167

let it project over the center view "B". It will be found that for every dotted line there is a corresponding invisible outline on "B". Care must be exercised in identifying lines when reading blueprints. A center line can be mistaken for a dotted line. Examples of the lines and a brief description of their meanings will be found on the pages which follow. The use of a model will greatly help in the study of the application of lines and the relationship of views.

CYLINDRICAL OBJECTS

The lines which show visible and invisible outlines have been used in the figures shown thus far. Sketching cylindrical objects brings into use another type of line — the center line. (Look at its construction on page 176.) Be careful to distinguish between the weights of lines as well as the way in which they are broken.

A good procedure to follow in sketching cylindrical objects is given below.

STEPS USED IN DRAWING CYLINDRICAL OBJECTS

1st. Draw center lines lightly as illustrated.

2nd. Draw circles — make lines heavy.

3rd. Draw light weight projection lines through side view position.

4th. Draw vertical lines dividing side view into its major divisions. Draw lightly.

5th. Trace in the side view in heavy outline.

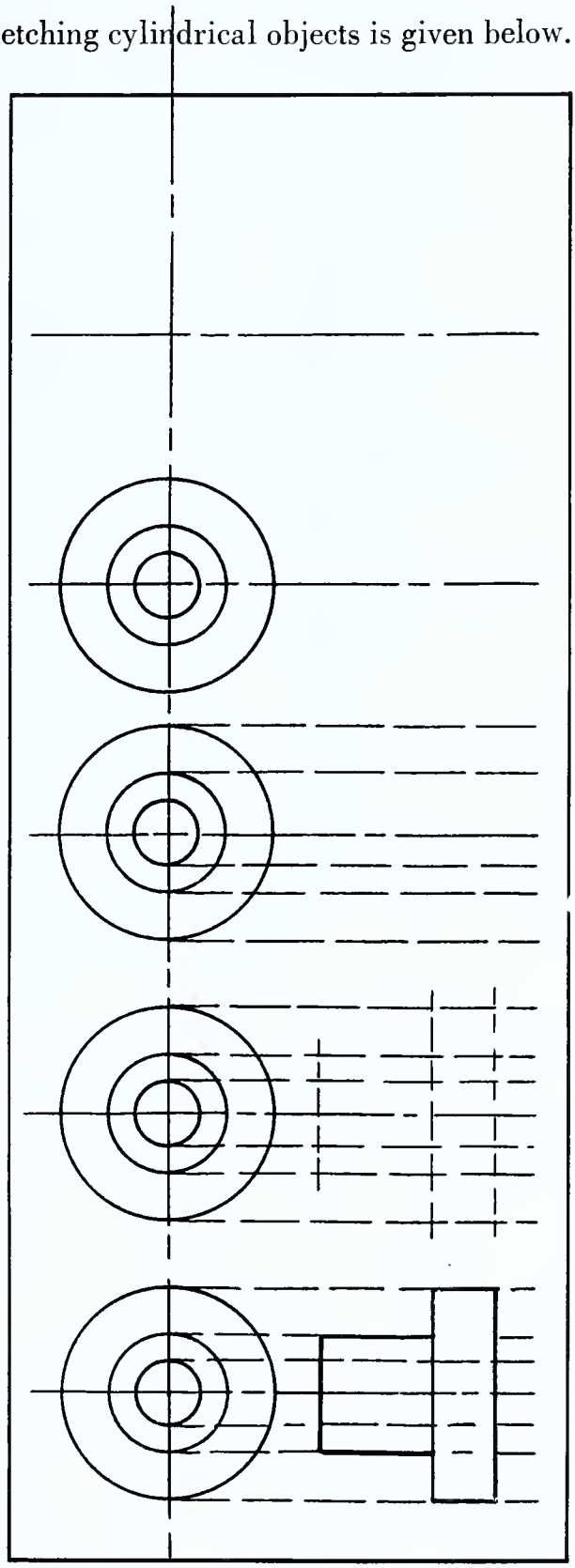


FIG. 168

Using a separate sheet of paper, sketch three views of the objects that follow, placing them so as to conform to standard practice.

PLATE LAP

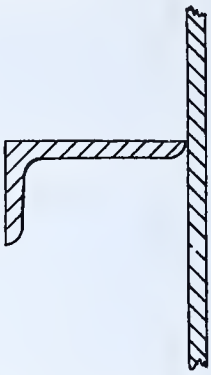


PLATE AND ANGLE

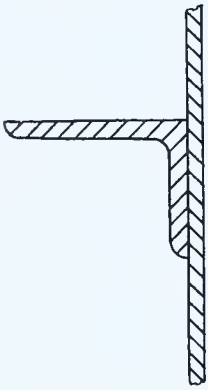


PLATE AND ANGLE

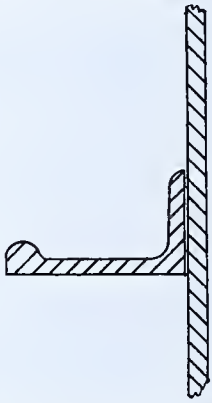
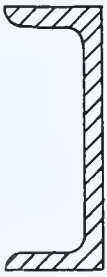


PLATE AND BULB ANGLE



CHANNEL

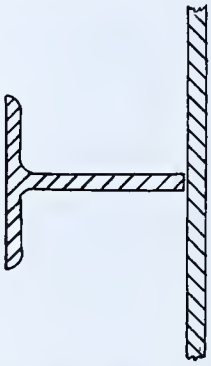
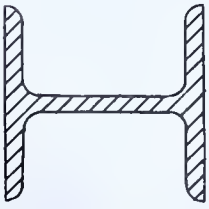


PLATE AND TEE



I BEAM

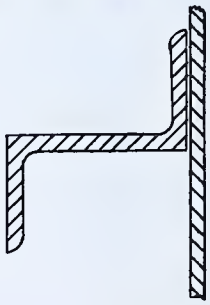


PLATE AND Z BAR

MODIFICATIONS OF THE THREE VIEW PRINCIPLE

Frequently it is unnecessary to show all three views of an object. If a mechanic can understand a print by referring to only one or two views of the object, it is necessary for the draftsman to draw only the views that the mechanic will need to do the job.

If, for example, we were to draw three views of a piece of pipe as shown in Fig. 168-A we would find that the top and front views would be identical.

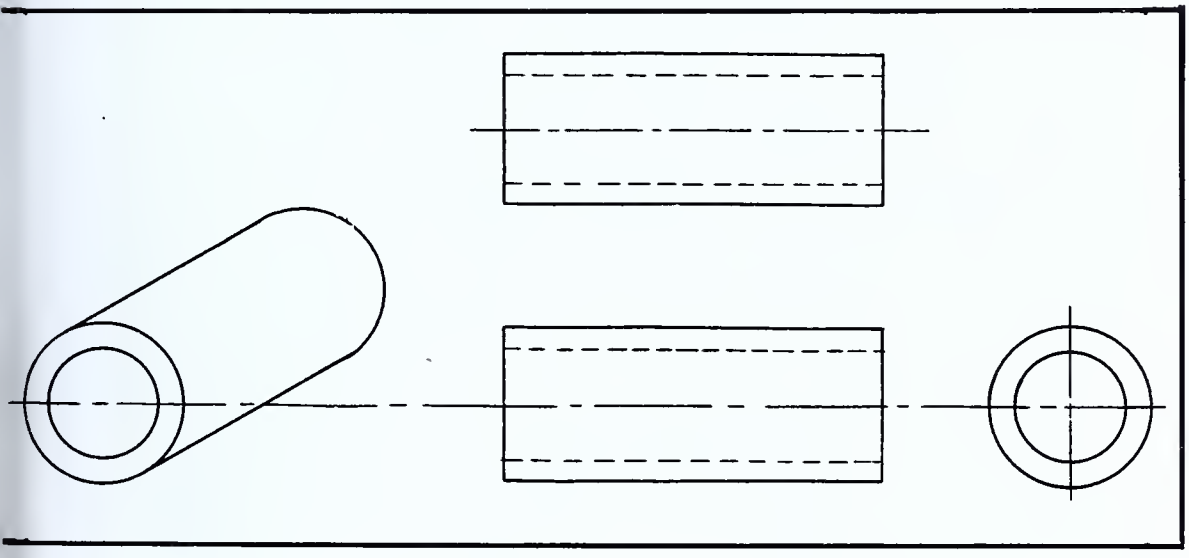
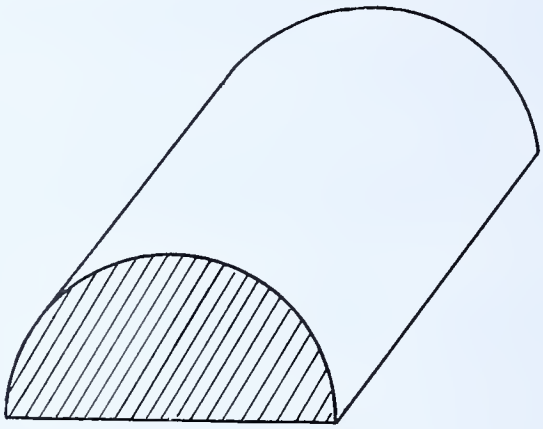


FIG. 168-A

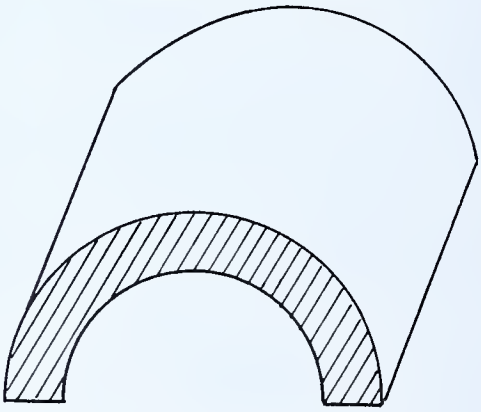
Therefore, only two views would be necessary to show the pipe in every detail.

CURVED EDGES

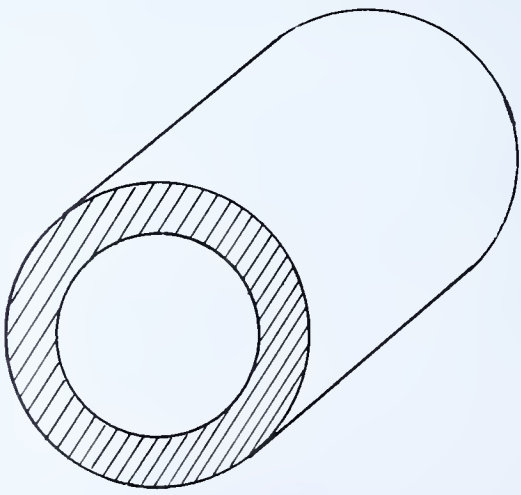
Using a separate sheet of paper, sketch the views necessary to represent the objects illustrated below.



SOLID HALF ROUND



HOLLOW HALF ROUND



PIPE

SECTIONAL VIEWS

Sometimes the interiors of objects are so complicated that it is difficult to show them clearly with dash lines. Too many hidden edge lines are confusing and difficult to interpret.

To show the construction clearly in many hollow objects the front or near part is imagined to be removed so that we imagine ourselves actually seeing the interior. Edges are consequently shown with a solid line instead of a dash line and the cut surface is hatched. (Slanted lines are drawn across the cut surface.) Study carefully Figures 169 and 170 below.

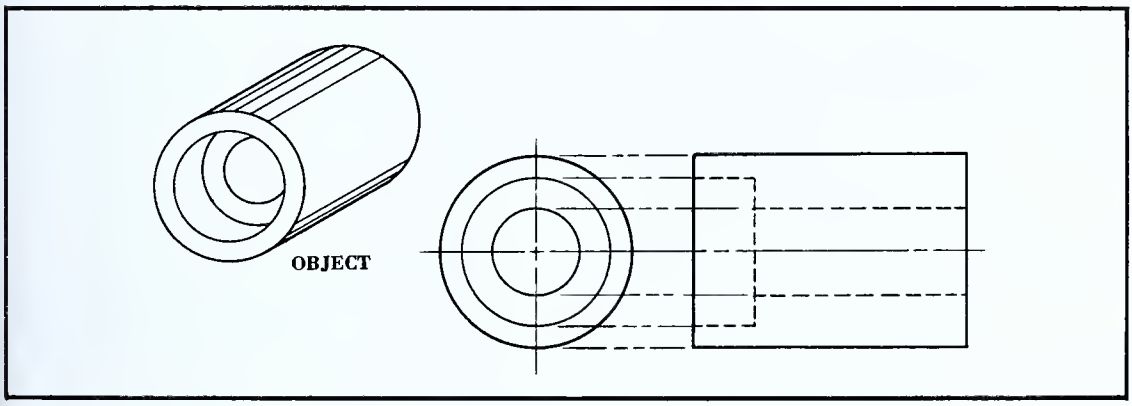


FIG. 169 — *Common Views*

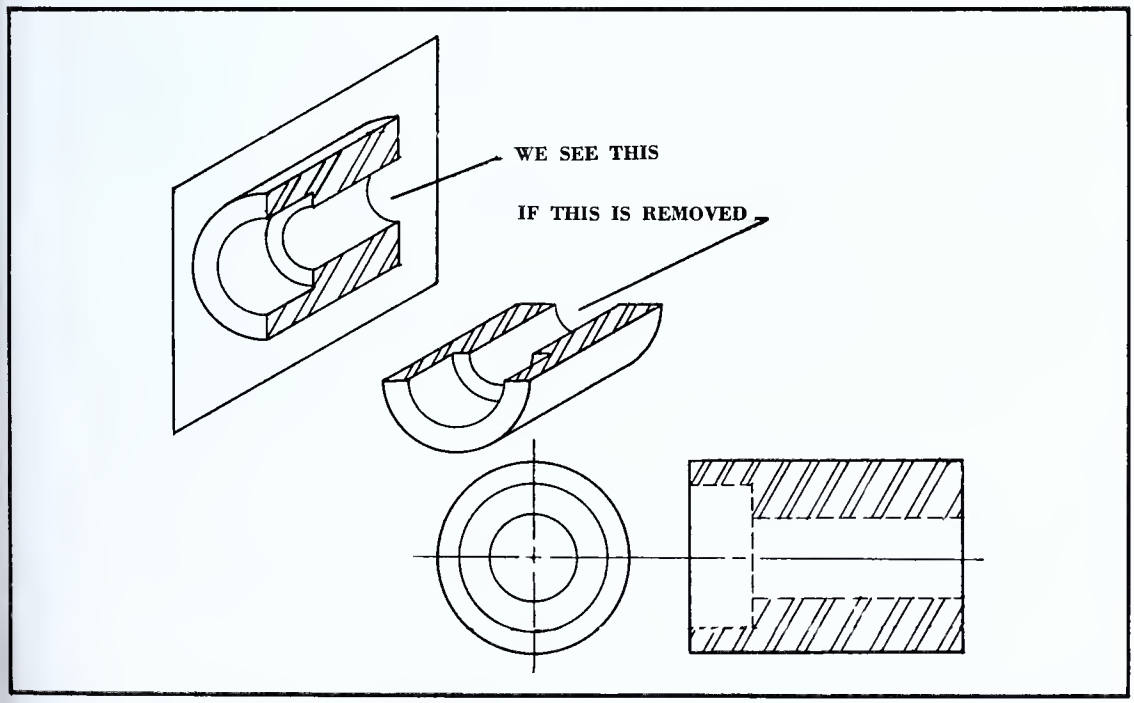


FIG. 170 — *Sectional View*

DIMENSIONS, NOTES, ETC.

In addition to the shape of an object the mechanic must know its size. Size is shown in a drawing by the use of lines, arrowheads, figures, etc., such as are indicated in Figure 171. Notice both the weight and construction of the lines used in dimensioning and check these with the rules for dimensioning given on page 167.

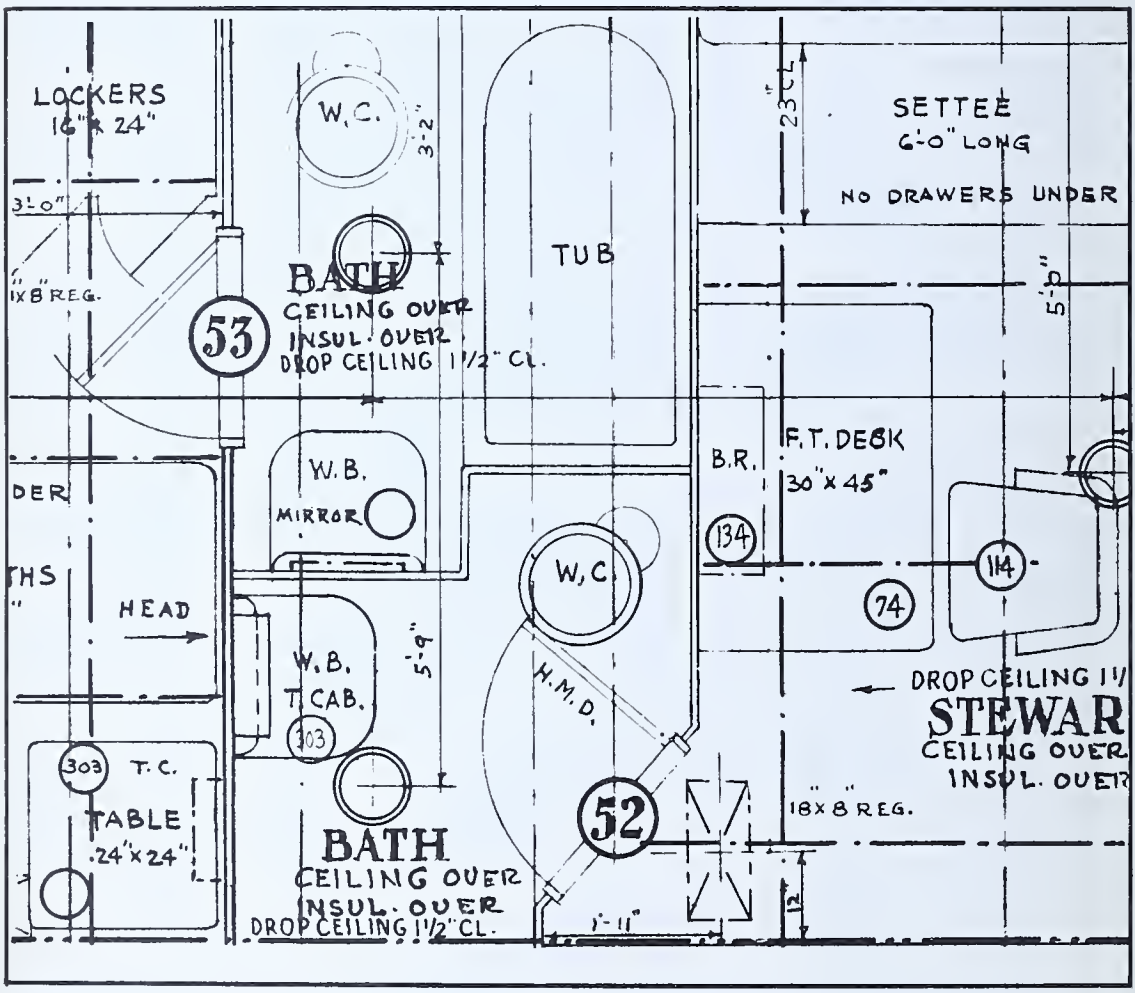


FIG. 171

DEFINITIONS

1. Leader — Refers a note to some part of the drawing.
2. Dimension Line — Carries figure denoting size or position — has arrowheads at end.
3. Note — Explanation in English inside circle or leader.
4. Extension Line — Refers dimension to point on drawing.

5. Dimension — Size of part or its location.
6. Detail Dimension — Size or part or its location.
7. Overall Dimension — Size over all (not just a part).
8. Location Dimension — Tells where something is.
9. Angle Dimension — Indicates the degree of angle.
10. Mark for Seam or Butt — Where two plates meet.
11. Arrowhead — Indicates the end of a dimension line.
12. Radius Dimension — Radius of an arc or circle.

RULES FOR DIMENSIONING

1. Place the dimensions where the mechanic can find them most readily.
2. The plan view should have the most dimensions.
3. Dimensions are usually preferred outside or between views unless clearer when placed on the view. Do not crowd dimensions.
4. Make a distinction in weight between the dimension lines and edge lines. See Figure 172.
5. Give the length, width, and height of all parts of the object.
6. Horizontal dimensions should read from the bottom; vertical dimensions should read from the right side of the drawing. See Figure 172.
7. Holes are usually dimensioned by note. See Figure 171.
8. Angles are dimensioned with the arc of a circle.
9. Place the letter "R" after all radius dimensions.
10. Complicated objects are made up of simple shapes which can be dimensioned by the rules given here. All that is needed in addition is a location dimension. This should be from center to center or from some reasonable line, such as a finished surface.
11. Do not repeat dimensions unless there is a good reason for so doing. Do not add unnecessary dimensions.
12. Never use a center line or edge line as a dimension line.
13. The side view of cylindrical objects usually is the best view on which to show diameters.
14. Notes should read horizontally, if possible.
15. Arrowheads should indicate from which side of the plate or angle the dimension is taken.

SCALE OF DRAWINGS

When small objects are drawn by the draftsman exactly to size we say the drawing is full scale or 12″ = 1 ft. Large objects are usually drawn in reduced size and very small objects are increased in size on the drawing. The dimensions placed on the drawing, however, are always the full size dimensions of the object. Some scales commonly used in reduction of size for drawing are 6″ = 1 ft., 3″ = 1 ft, 1½″ = 1 ft., ¾″ = 1 ft., etc. The title of the drawing usually tells to what scale the drawing has been made.

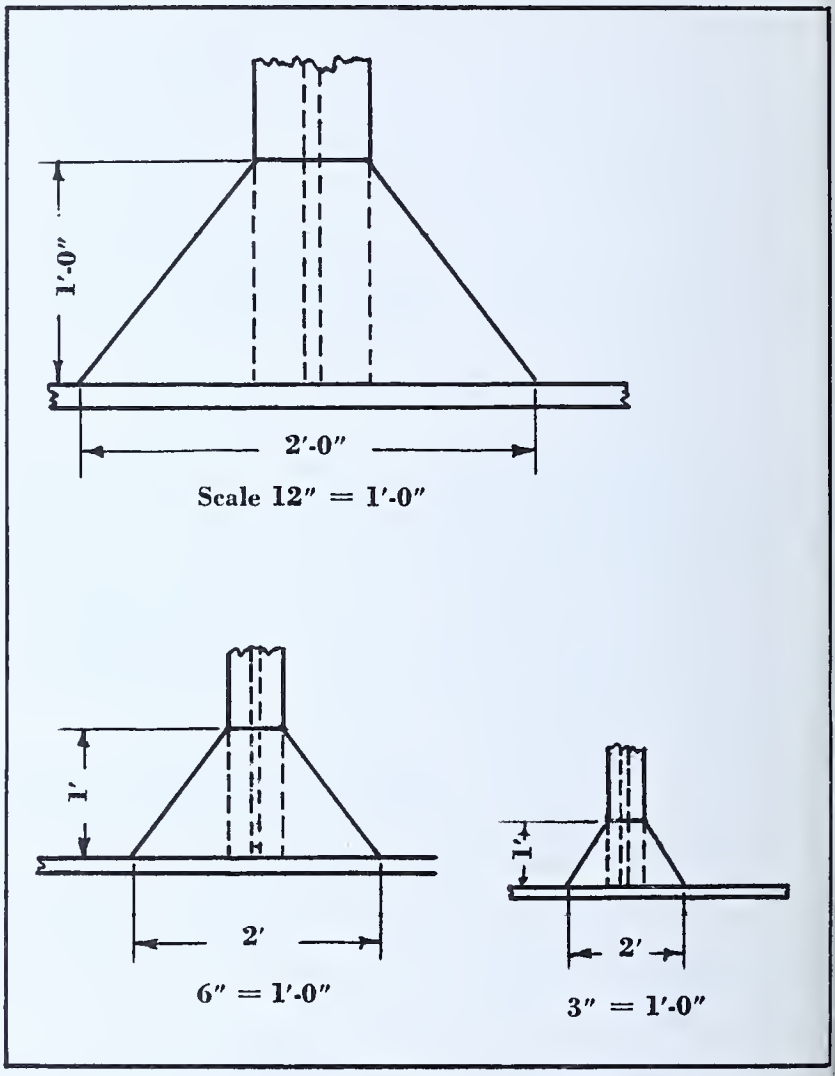


FIG. 172

Most shipbuilding drawings are made to scales of ½″ = 1 ft. or ¼″ = 1 ft.

QUESTIONS AND PROBLEMS

(Print numbers 1–8 refer to reproductions of blueprints enclosed in the envelope bound in the back of this book).

Print No. 1

1. Locate the center line of the ship.
2. Locate the intermediate bulkhead between the captain's state room and the captain's office.
3. Locate the longitudinal intermediate bulkhead forming the radio operator's room.
4. Check the difference between the intermediate bulkheads forming the radio operator's room and the joiner's intermediate bulkheads.
5. Locate the longitudinal intermediate bulkhead forming the slop chest.
6. Locate the longitudinal bulkhead forming the captain's wardrobe.
7. Locate the longitudinal bulkhead forming the radio operator's wardrobe.
8. Locate the athwartship bulkhead between the radio operator's and captain's bath.
9. Locate the athwartship bulkhead between the radio operator's bath and the slop chest.
10. Locate the athwartship bulkhead between the captain's bath and the captain's state room.
11. Locate the athwartship bulkhead between the radio operator's room and the passage way.
12. Locate the athwartship bulkhead forming the captain's state room and the captain's office.
13. Locate the athwartship bulkhead forming the radio operator's wardrobe.
14. Locate the athwartship bulkhead forming the captain's wardrobe.
15. List the location of the furniture installed by the joiner in the captain's state room.
16. List the location of the furniture installed by the joiner in the captain's office.
17. List the location of the furniture installed by the joiner in the radio operator's room.
18. List the location of the furniture installed by the joiner in the radio room.
19. List the location as shown on Print No. 1 of any furniture installed by the joiner in the bathrooms.
20. List the location as shown on Print No. 1, of the doors installed by the joiner.
21. List the location of all the portlights shown on Print No. 1.
22. List any questions regarding Print No. 1 which you would like to have answered.

Print No. 2

1. Locate the center line of the ship.
2. Locate the intermediate bulkhead between the wheelhouse and the chart room.
3. Locate the longitudinal intermediate bulkhead between the gyro room and the chart room.

4. Locate the athwartship intermediate bulkhead between the gyro room and the chart room.
5. List the location on Print No. 2 of all doors installed by the joiner.
6. List the location of all the portlights shown on Print No. 2.
7. List the location on Print No. 2 of all the furniture installed by the joiner.
8. List any questions regarding Print No. 2 which you would like to have answered.

Print No. 3

1. Locate the center line of the ship.
2. Locate the intermediate bulkhead between the passageway and the hospital and steward's state room.
3. Locate the intermediate bulkhead forming the port side of the passageway.
4. Locate the longitudinal intermediate bulkhead between the 3rd officer's state room and the bathrooms.
5. Locate the longitudinal intermediate bulkhead between the 2nd officer's state room and the bathrooms.
6. Locate the intermediate bulkheads forming the hospital bath.
7. Locate the intermediate bulkheads forming the steward's bath.
8. Locate the intermediate bulkheads forming the 2nd officer's bath.
9. Locate the intermediate bulkheads forming the 3rd officer's bath.
10. Locate the athwartship intermediate bulkhead between the steward's state room and the 2nd officer's state room.
11. List the location as shown on Print No. 3 of all the doors installed by the joiner.
12. List the location of all the portlights shown on Print No. 3.
13. List the location of all furniture installed by the joiner in the 2nd officer's state room.
14. List the location of all furniture installed by the joiner in the 3rd officer's state room.
15. List the location of all furniture installed by the joiner in the hospital.
16. List the location of all furniture in all bathrooms on Print No. 3.
17. List the location of all furniture installed by the joiner in the steward's room.
18. Locate the medicine locker.
19. List any questions regarding Print No. 3 which you would like to have answered.

Print No. 4

1. Locate the center line of the ship.
2. Locate the longitudinal intermediate bulkhead forming the chief engineer's office, state room and the 4th assistant engineer's state room.
3. Locate the athwartship intermediate bulkhead between the chief engineer's office and chief engineer's state room.
4. Locate the athwartship intermediate bulkhead between the chief engineer's state room and the linen locker.
5. Locate the intermediate bulkheads forming the chief engineer's bathroom.

6. Locate the athwartship intermediate bulkhead between the 4th assistant engineer's room and the bath and linen locker.
7. List the location of the furniture installed by the joiner in the chief engineer's office.
8. List the location of the furniture installed by the joiner in the chief engineer's state room.
9. List the location of the furniture installed by the joiner in the 4th assistant engineer's state room.
10. List the location of the furniture installed by the joiner in the chief engineer's bathroom.
11. List the location on Print No. 4 of all doors installed by the joiner.
12. List the location of all the portlights shown on Print No. 4.
13. List any questions regarding Print No. 4 which you would like to have answered.

Print No. 5

1. Locate the longitudinal intermediate bulkhead forming the passage way and the three rooms.
2. Locate the athwartship intermediate bulkhead between the four oilers' room and the three firemen's and spares' room.
3. Locate the athwartship intermediate bulkhead between the 3-firemen's and spare's room and the 3-wipers' and 1-spare's room.
4. What difference is there between the above two mentioned bulkheads, and the bulkheads mentioned in No. 1?
5. List the location on Print No. 5 of all doors installed by the joiner.
6. List the location of all portlights shown on Print No. 5.
7. List the location of all furniture installed by the joiner in the 4 oilers' room.
8. List the location of all furniture installed by the joiner in the 3 firemen's and spare's room.
9. List the location of all furniture installed by the joiner in the 3-wipers' and spares' room.
10. What is the width of the passage way on Print No. 5?
11. List any questions regarding Print No. 5 which you would like to have answered.

Print No. 6

1. Locate the center line of the ship.
2. Locate the athwartship intermediate bulkhead forming the officers' mess room, the pantry, and the crew's and petty officers' mess room.
3. Locate the longitudinal intermediate bulkhead between officers' mess room, the officers' mess room, the galley, and the pantry.
4. Locate the longitudinal intermediate bulkhead between the crew's and petty officers' mess room, the galley, and the pantry.
5. List the location on Print No. 6 of all doors installed by the joiner.

6. List the location of all the portlights shown on Print No. 6.
7. List the location of the furniture installed by the joiner in the officers' mess room.
8. List the location of the furniture installed by the joiner in the crew's and petty officers' mess room.
9. List the location of the furniture installed by the joiner in the galley.
10. List the location of the furniture installed by the joiner in the pantry.
11. List any questions regarding Print No. 6 which you would like to have answered.

Print No. 7

1. Locate the bathrooms represented by Figs. 1, 2, 3, and 4 by referring to the previous plans studied.
2. Make up a cutting list for panels for each bathroom.
3. Locate all doors for each bathroom.
4. List the length and width of all shower stalls.
5. List the location of bathroom trim.
6. List any questions regarding Print No. 7 which you would like to have answered.

Print No. 8

1. Locate and give the length and width of steel cuts in deck.
2. What is the run of the stairs? List the dimension.
3. How many risers are there and what is the dimension?
4. What is a riser?
5. What is a tread?
6. How many treads are shown? What is the dimension of the tread?
7. On which side of the stairway is the hand rail located?
8. List the location of all dimensions necessary to set the stairs.
9. List any questions regarding Print No. 8 which you would like to have answered.

Part IX

GLOSSARY

A

ACCOMMODATION LADDER — A portable ladder or stairway hung over the side of a ship to accommodate people who are boarding from, or disembarking to, small boats or a pier.

ADZ — A hewing tool having its cutting blade at right angles to the handle. The type used in the shipyard has a lip on each side and is called a foot adz or a lip adz.

AFT, AFTER — Near, toward, or in the stern of the ship.

AFTER-PEAK TANK — A tank in the extreme aft end or stern of a ship.

ANCHOR-STOCK CUTS — Cuts used in covering boards, margins, strakes, and rails. They are so called because of their resemblance to anchor stocks.

AUGER — A carpenter's tool for boring holes in large timbers.

AWNING — A covering or canvas shelter over a ship's deck.

B

BATTEN — A long narrow strip of wood used for fairing lines. Wooden, protective strips in cargo holds.

BELTING — The horizontal framing running between studs.

BILGE — The rounded portion of a ship's shell which connects the bottom with the sides. The recess into which the drain water or bilge water of a ship runs.

BOAT COVERS — Canvas or wooden covers used to protect lifeboats from the rain and sun.

BOAT FALLS — Tackle used to raise and lower a lifeboat on the davits.

BOOM — A heavy arm (usually wood) pivoted at one end, used for loading and unloading cargo.

BOOM REST — A bracket or holder in which the boom is placed when not in use.

BOW — The front or forward end of a ship.

BUFFET — A cabinet used for serving in the main saloon on a ship. Dishes and silverware are also kept in it.

BUILDING WAYS — Foundations on which a ship is built.

BULKHEAD — A watertight partition extending from the double bottom to the top main deck, so constructed that in case of accident in one compartment, damage is confined to that compartment. A partition in a ship which divides the interior into various compartments.

BULWARK — The side of a ship above the weather deck.

BUNK — A type of bed used on a ship.

BUTT — The end of a plank where one plank joins another.

C

CANVAS — A very strong, heavy cotton cloth.

CARLIN — A short, fore-and-aft timber connecting the beams on which the deck is laid.

CARRIAGE BOLT — A bolt with a round head and a square shoulder.

CASING — The extra case or bulkhead built around the ship's funnel to protect the decks from heat.

CALKING (OR CAULKING) — Making decking or planking watertight by driving cotton and oakum into the seams with a calking iron and mallet.

CEILING — The inside skin of a vessel between decks, or in a small vessel from the deck beams to bilge. Wood sheathing on the tank top, sides of a ship, etc.

CEMENT CHOCK — Cement is poured over a wooden form fitted between the vertical frames of a ship. This cement keeps accumulating dust and trash from falling into the bilges.

CHAMFER — To cut off the sharp edge of a corner. To bevel.

CHOCK — A deck fitting through which mooring lines pass.

CLAMP — A metal or wood fastening which holds material together.

CLEAT — A piece of wood or metal used to belay ropes.

CLEAN UP — To plane, scrape, or sand to a smooth finish.

COAMING — A finish placed or built around a hatch or any opening in a deck.

COLLAR — A band or ring to cover an opening.

COMPANION LADDER, COMPANIONWAY — A stairway leading from one deck to another.

COMPASS STAND — A support for the ship's compass.

CORK BOARD — Cork in sheet form. The usual form is 1″ to 3″ in thickness, 12″ in width, and approximately 3 feet in length.

CORK, GRANULATED — Cork ground very fine.

CRANES — Heavy hoisting apparatus on the sides of a ship to handle boats, rafts, etc.

CROWN OF DECK — The camber of a deck, the shape in which a deck is built so that it will shed water. Mainly for strength.

D

DAVITS — A set of cranes or radial arms on the gunwale of a ship, from which the lifeboats are suspended.

DECK — A deck in a ship corresponds to a floor in a building.

DECKHOUSE — A house erected on the deck of a ship for any purpose.

DEADLIGHTS — Heavy glass in portholes; also heavy glass sometimes placed in decks.

DERRICK — A device for hoisting heavy cargo, etc.

DIVIDERS — A tool that is used to scribe circles or to divide a given length into equal parts.

DOOR JAMB — Part of a doorframe.

DOUGH BOX — A container used for mixing dough.

E

EDGE GRAIN — Wood which has been sawed so as not to show a flat or surface grain.

EYE BOLT — A threaded steel rod the head of which is in the form of an eye.

F

FELT — A fabric made of rolled wool, wool and fur, or hair, compacted by pressure and rolling.

FIRE STATION — A location aboard ship where fire hydrants are installed.

FLAT-GRAIN PIECES — Pieces of wood in which the grain runs parallel to the face of the boards.

FLASHING — Making a joint watertight by means of lead sheeting, webbing, etc.

FLUSH — Even with or level.

FORECASTLE — That part of the upper deck forward of the foremast. It is sometimes used as the crew's quarters.

FOREPEAK — The narrow extremity of a ship's bow. Also the hold space within it.

FORE PLANE — A hand tool larger than a smooth plane.

FORWARD — Towards the stem or front of the ship.

FURRING — Pieces of wood attached to a surface. A framing or foundation for interior panel work or ceiling.

G

GANGWAY — A gang plank from the ship to the pier to allow people access to and from the ship.

GOOSENECK — An iron swivel, making up the fastening between a boom and a mast. It consists of a pin and an eye bolt, or clamp.

GOUGE — A type of chisel used for wood turning, also for cutting grooves.

GRATING — Slats or strips fastened on pieces running at right angles to them.

GROMMET — A ring of lamp wicking used as a washer or gasket around bolts and studs to make watertight joints.

GROOVE — A channel cut in wood.

GUNWALE — The upper rail of a boat or vessel. The line where a shelter deck stringer meets the shell.

H

HANDHOLE — A hole cut to form a means for lifting or to make a place to take hold.

HANDGRIP — A piece of half-round iron placed over a handhole in a hatch to form a handhold.

HANDSAW — A tool for cutting wood.

HAMMER — A tool for driving nails.

HATCH — An opening in the deck of a ship for loading or unloading cargo.

HATCH BATTENS — Flat bars which are wedged against hatch coamings to secure tarpaulins.

HALYARD (OR HALLIARD) — A rope or line for hoisting and lowering flags, sails, etc.

HARDWARE — A name given all fastenings aboard ship, such as locks, hinges, cleats, screws, etc.

HEADSTOCK — The part of a wood lathe that supports the movable center.

HULL — The shell of a vessel.

I

INSULATE — To pack with an approved type insulation as specified.

J

JACK STAFF — A small flagstaff at the bow of the ship on which the union jack is usually hoisted.

JACOB'S LADDER — A flexible ladder made of rope and wooden treads. It is also called a pilot's ladder.

JIG SAW — A power-driven saw for fine scrollwork.

JOINER — One who does woodwork or metal work of a finishing nature.

K

KEEL — The backbone of a ship. A series of connected plates running fore and aft on the bottom of the center line of a ship.

KEELSON — A vertical strake of plates on the keel at the center line, running fore and aft from stem to stern.

L

LAG SCREW — A large, square-headed wood screw which is screwed in with a wrench.

LAGGING SHAFT ALLEY — A lagging or staving placed around the shaft alley, sometimes the full length of the shaft alley and sometimes only in the way of the hatches; the lagging receives all the hard knocks from the cargo and protects the alley.

LAUNCHING WAYS — Ways placed under a ship after the hull construction is complete and ready to be placed in the water. The launching ways are a means of skidding the ship into the water.

LAY OUT — To measure or scribe from a template before cutting.

LICENSE FRAMES — Frames (much like picture frames) in which the ship's officers' licenses are placed.

LIGHT SCREEN ON MAST — A partially enclosed bracket designed to hold the mast light.

LIGNUM VITAE — A hardwood that grows in tropical countries. It is used mostly for lining bearings and stern tubes on a ship.

LOCKER — A storage compartment in a ship.

LONGITUDINAL — A fore-and-after member in a ship.

LYLE GUN — A gun used for firing a life line from ship to shore or to another ship.

M

MALLET — A hammer-shaped tool with a wooden head.

MARGIN STRAKE — A strake used on the outer edge of decking, around bitts on deck houses and on tank tops. It is called margin strake because it forms a margin around any of these parts.

MAST WEDGES — Wooden wedges used around masts and top masts to secure and steady them in place and to make the holes or spaces into which they are dropped, watertight.

MAST — A spar or hollow steel pipe tapering toward the top, placed on the center line of the ship.

MAUL — A heavy hammer or iron mallet.

MESS ROOM — A dining room on board ship.

MIDSHIP — At the broadest part of the ship; at or near the middle of the length of a ship.

MITER — An angle cut.

MOLD (OR MOULD) — A pattern or template.

MORTISE — A cavity cut into a piece of wood to receive a tenon.

N

NAVIGATION BRIDGE — The platform or deck used for taking observations and directing the handling of the ship.

O

OAKUM — A material made of tarred rope fibers. It is used for calking seams in a wooden deck.

OFFSET — To bend sharply out of line.

OUTBOARD — Away from the center line of a ship; toward the side of the ship; or outside of the bulwarks of the ship.

OVERHANG — To project over.

P

PAYED — Coated with hot pitch. Payed is a term used by a calker when he pitches the deck with a pitch ladle. ("He *payed* the deck with pitch." This means that he filled seams between planks as a last operation.)

PLANK — A piece of lumber from 1½" to 3" thick and of various widths.

PLUGGING, DECK PLUGGING — A means of finishing a countersunk hole by placing in it a wood plug that is matched with the grain and then smoothed off to a good finish.

PLUG HATCHES — Insulated hatches used in refrigerated ships in the bilges and in the main deck hatches.

PORT — The left-hand side of a ship, standing midship looking forward.

P.O.'s MESS ROOM — Petty Officers' Mess Room.

Q

QUARTERSAWED — Lumber cut at the mill so as to show a vertical or edge grain in the face of a board or plank. For example: quartersawed oak shows flakes.

QUARTERS — The crew's living space.

R

RABBET — An edge having material removed to accommodate other material to be applied on that edge.

RAKE — Set on an angle. Slope of a mast, king post, etc.

REAM — To make larger, or fair up, as "to ream a hole."

RINGBOLT — An eye bolt with a ring set in the eye of the bolt.

ROLL ROOFING — A covering material made of composition or tar paper.

ROUND UP — To smooth off corners; to make round, as "to round up" a boom or spar.

S

SCARF (SCARPH) — To taper or bevel the edge or side of a piece of material to make a scarph joint.

SCUPPERS — Deck drains, openings in the shell plating just above the deck plating to allow water to run overboard.

SCANT — Just smaller than the size intended.

SCRIBE — To draw a line with a pointed instrument.

SEAM — An opening between two boards or planks when they are placed together.

SHEAVE — A grooved pulley wheel.

SHELL OF A SHIP — The skin or plates of the hull.

SHIMMING — To build up or space out with shims (metal or wood).

SHORE — A beam set endwise as a prop.

SHROUDS — Rigging to support masts.

SILLS — Foundations for deck houses, such as wheelhouse, radio room, etc.

SIGNAL HALYARD — A small halyard or line that runs up in the rigging. It is used for running up signals.

SLEEPERS — Foundation timbers for flooring or tank top, etc.

SLIDING WAY — A structure of heavy timbers placed between ground ways and cradle to support the ship during launching.

SLING — A strap made of rope or wire and placed around loads for lifting with a crane or boom.

SOCKET — A hole in a casting into which another casting fits.

SOUNDING PIPE — A vertical pipe leading from the main deck to the double bottom by means of which the depth of liquid in the tank can be measured.

SPAR — A long, round member, used for a hoist, boom, topmast, etc.

SPOKESHAVE — A hand tool on the order of a drawing knife or small transverse plane for working out or rounding up a curved section of wood.

STANCHION — A pillar or iron post for supporting decks, etc.

STARBOARD — The right-hand side of a ship, standing midships looking forward.

STEERING WHEEL — The wheel that connects with the tiller motor (or the tiller) and steers the ship.

STEM — The bow of the ship, the part where the port and starboard meet up forward.

STERN — The after or rear end of the ship.

STRONGBACK — A bar for locking cargo port doors and watertight scuttles. A bar for receiving wooden hatch covers on cargo ships.

STUDDING — A vertical part of framing made of wood.

SHIP SHELL — The outside plating of a ship from stem to stern.

T

TAP — An internal threading tool.

TACK — A small, short, sharp-pointed nail, usually having a broad, flat head.

TANKER — A ship that is equipped with tanks for carrying a liquid cargo.

TANK TOP — Plating to form a water or oil tight compartment in the bottom of a ship.

TANK TOP COVERING — A wood covering placed on the metal tank top in the cargo hold of a ship to protect the tank and the cargo.

TEMPLATE — A pattern.

'TWEEN DECKS — The space between any two decks.

TIE ROD — Long rod used for holding down or holding together any structure.

TOPPING LIFT — A lift used for topping up the end of a boom.

TRIM — To even up by cutting or removing wood.

TRUCK — A disk at the upper extremity of a mast, jack staff, or flagstaff, through which the signal halyards are run.

TRY SQUARE — A small handy instrument for trying the square of surfaces while planing or fairing up with any tool.

V

VENTILATOR — A device used for furnishing fresh air to the compartments below deck, or for exhausting foul air.

W

WAYS — The framework of timber and other material on which a vessel is built and from which it is launched into the water.

WATERWAY — The gutter which provides for drainage along the edge of a deck.

WEDGES — Tapered pieces of iron or wood.

WHEELHOUSE, PILOTHOUSE — The house from which the ship is steered or navigated.

WING — That part of the hold or 'tween decks that is next to the side of the ship.

WRENCH — A tool for tightening bolts and nuts.

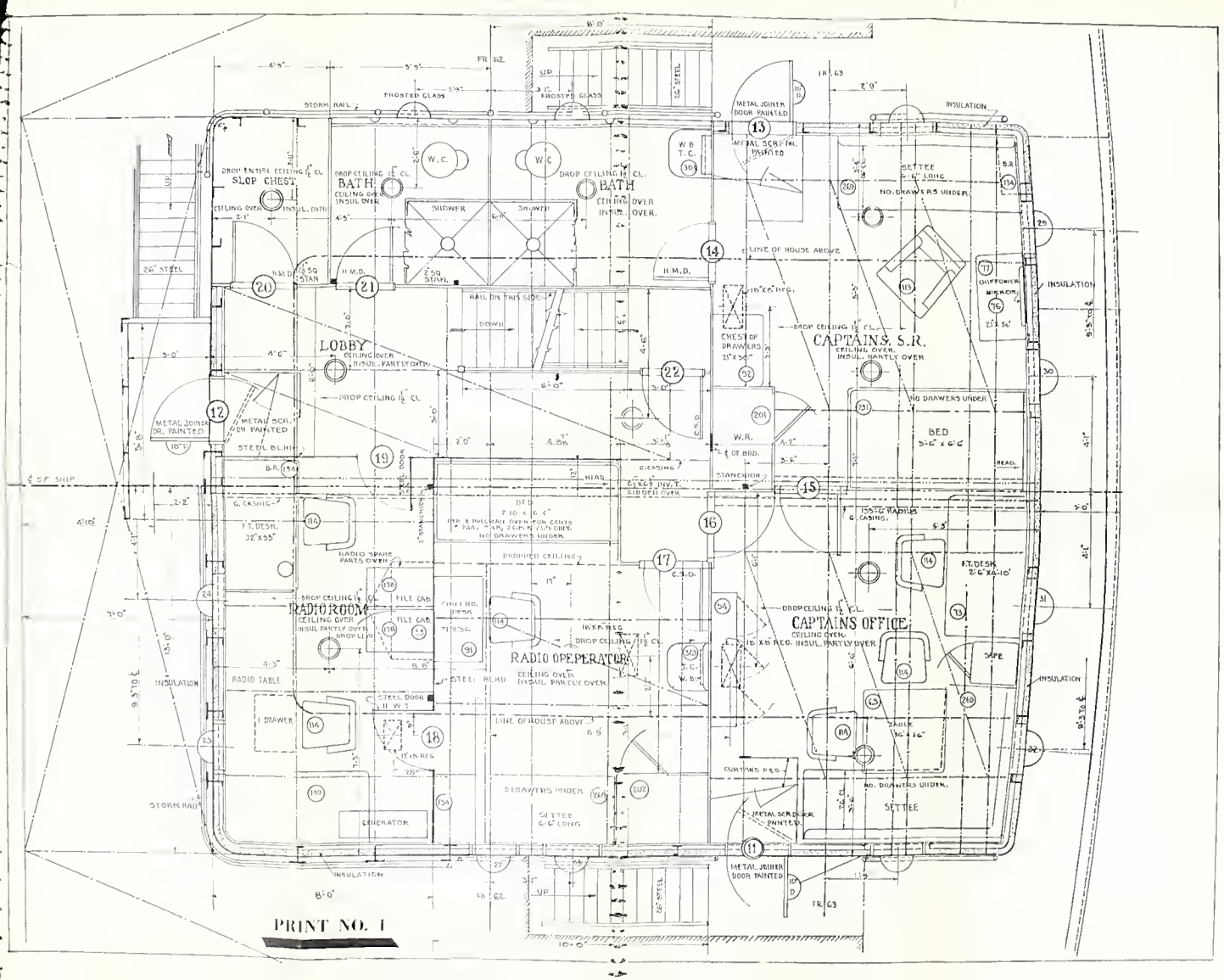
INDEX

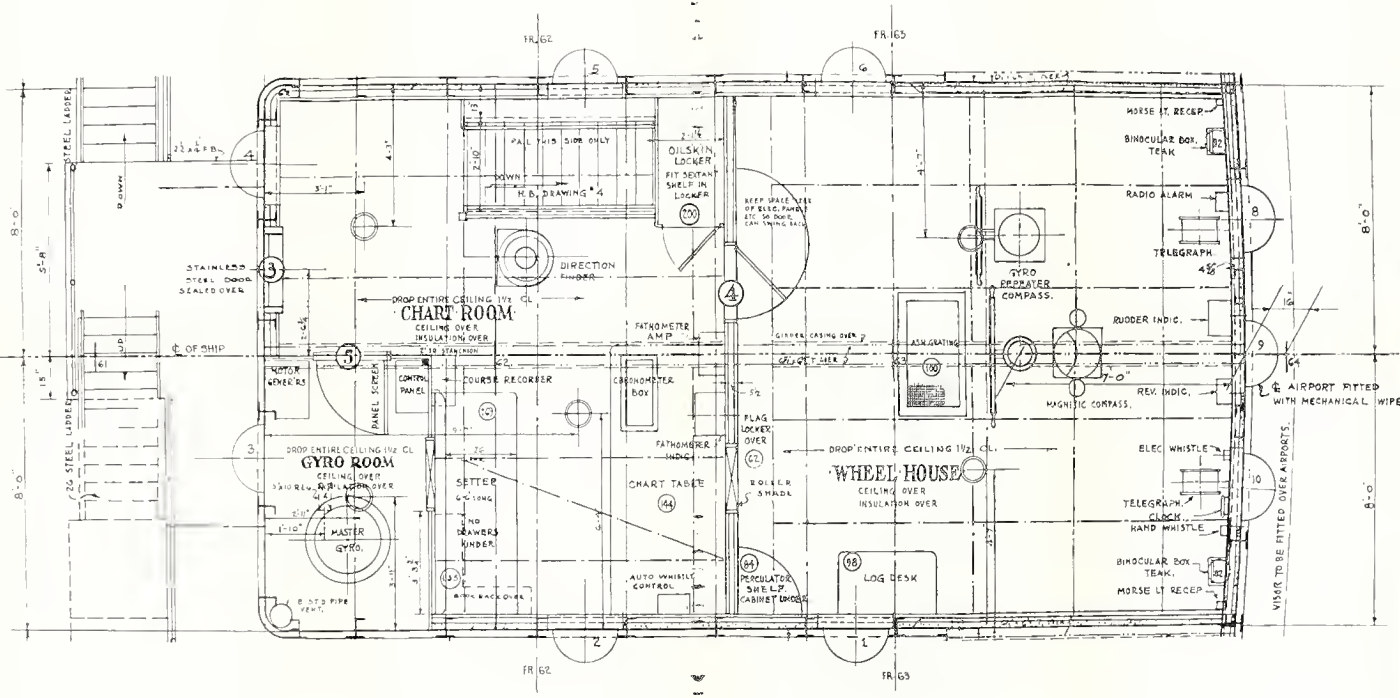
S

T

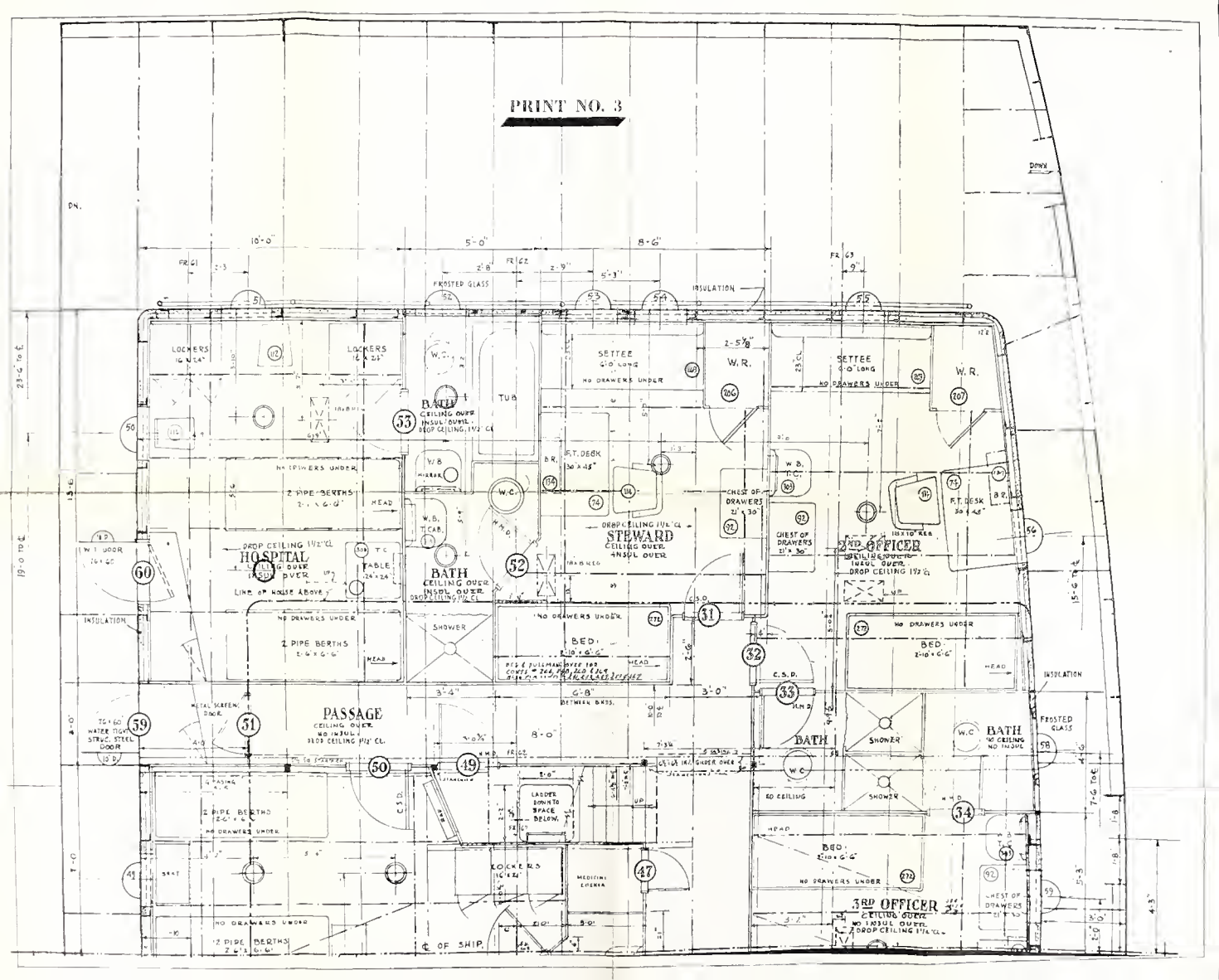
U

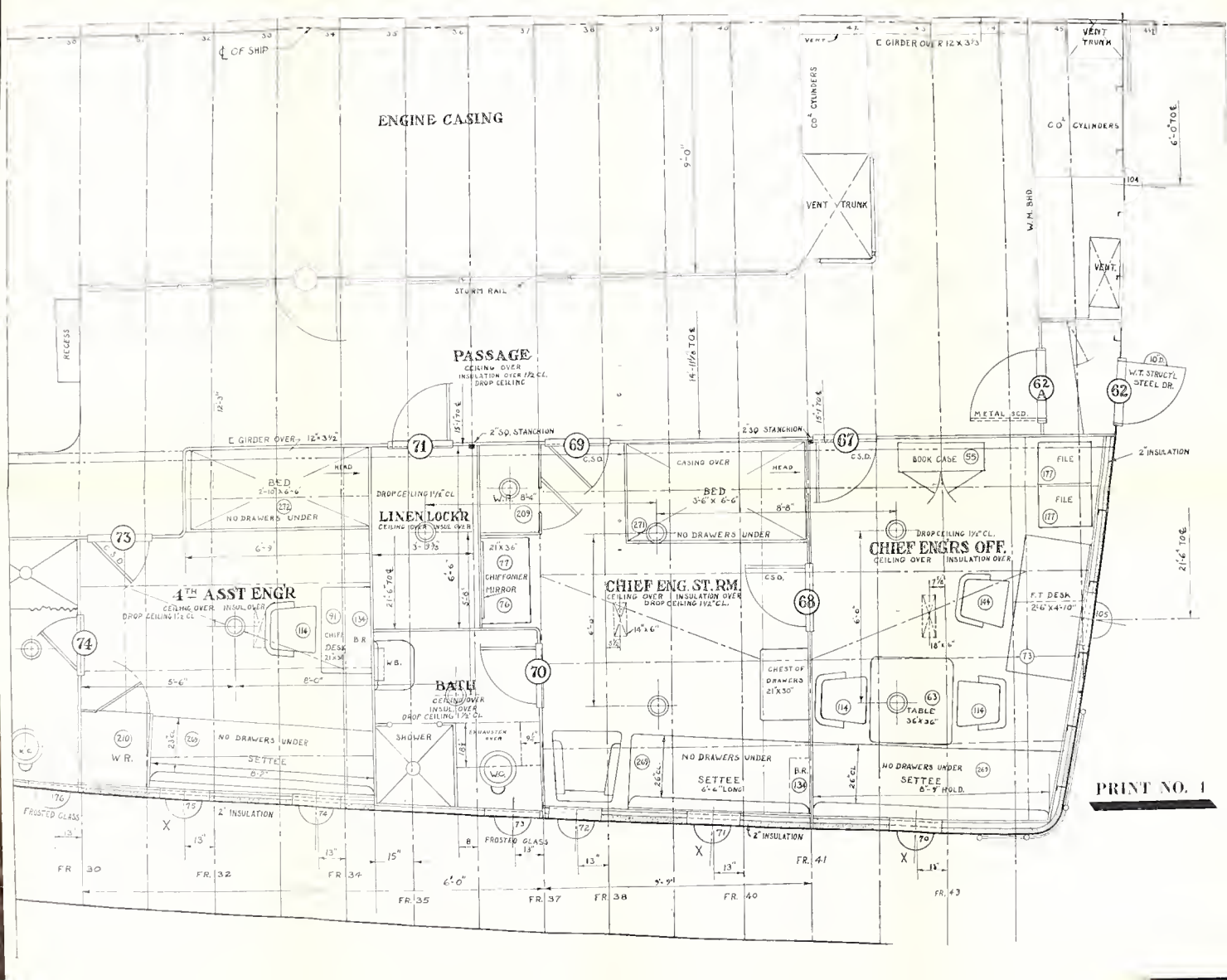
W


LOBBY
CEILING OVER INSUL. PARTLY OVER
RADIO ROOM
CEILING OVER INSUL. PARTLY OVER
RADIO OPERATORS
CEILING OVER INSUL. PARTLY OVER
CAPTAINS, S.R.
CEILING OVER INSUL. PARTLY OVER
CAPTAINS OFFICE
CEILING OVER INSUL. PARTLY OVER
SLOP CHEST
BATH
BATH
W.C.
W.C.
SHOWER
SHOWER
BED
SETTEE
F.T. DESK
RADIO TABLE
1 DRAWER
INCINERATOR
SAFE
CHEST OF DRAWERS
METAL JOINER DOOR PAINTED
METAL SCR. DR. PAINTED
STEEL BLKD.
STORM RAIL
INSULATION
FROSTED GLASS
RAIL ON THIS SIDE
LINE OF HOUSE ABOVE
DROPPED CEILING
PRINT NO. 1

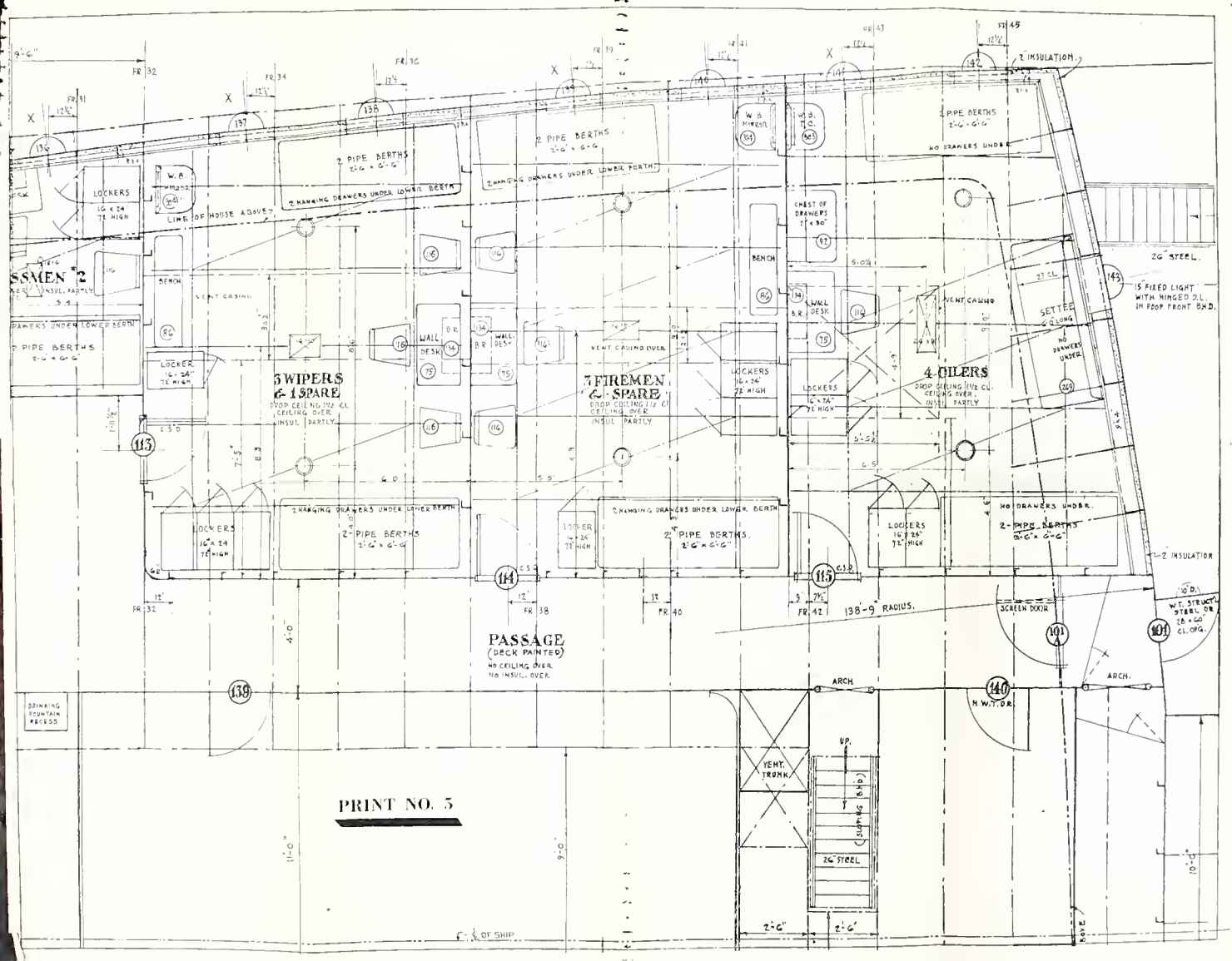

FR 62
FR 165
FR 62
FR 63
STEEL LADDER
DOWN
STAINLESS STEEL DOOR SEALED OVER
℄ OF SHIP
STEEL LADDER
CHART ROOM
CEILING OVER INSULATION OVER
DROP ENTIRE CEILING 1½ CL
GYRO ROOM
CEILING OVER
DROP ENTIRE CEILING 1½ CL
WHEEL HOUSE
CEILING OVER INSULATION OVER
DROP ENTIRE CEILING 1½ CL
OILSKIN LOCKER
FIT SEXTANT SHELF IN LOCKER
PULL THIS SIDE ONLY
H.B. DRAWING
DIRECTION FINDER
KEEP SPACE FREE OF ELEC. PANELS ETC SO DOOR CAN SWING BACK
FATHOMETER AMP.
GIMBEL CASING OVER
ASH GRATING
GYRO REPEATER COMPASS.
RUDDER INDIC.
MAGNETIC COMPASS.
REV. INDIC.
MORSE LT. RECEP.
BINOCULAR BOX TEAK
RADIO ALARM
TELEGRAPH
℄ AIRPORT FITTED WITH MECHANICAL WIPER
VISOR TO BE FITTED OVER AIRPORTS.
MOTOR GENERATORS
CONTROL PANEL
PANEL SCREEN
COURSE RECORDER
CHRONOMETER BOX
FATHOMETER INDIC.
FLAG LOCKER OVER
ROLLER SHADE
SETTEE
6'-6" LONG
NO DRAWERS UNDER
CHART TABLE
MASTER GYRO.
AUTO WHISTLE CONTROL
PEDESTAL SHELF CABINET UNDER
LOG DESK
ELEC. WHISTLE
TELEGRAPH
CLOCK
HAND WHISTLE
BINOCULAR BOX TEAK
MORSE LT. RECEP.
8'-0"
5'-8"
4'-3"
3'-1"
2'-10"
2'-6"
1'-10"
7'-0"
6'-0"

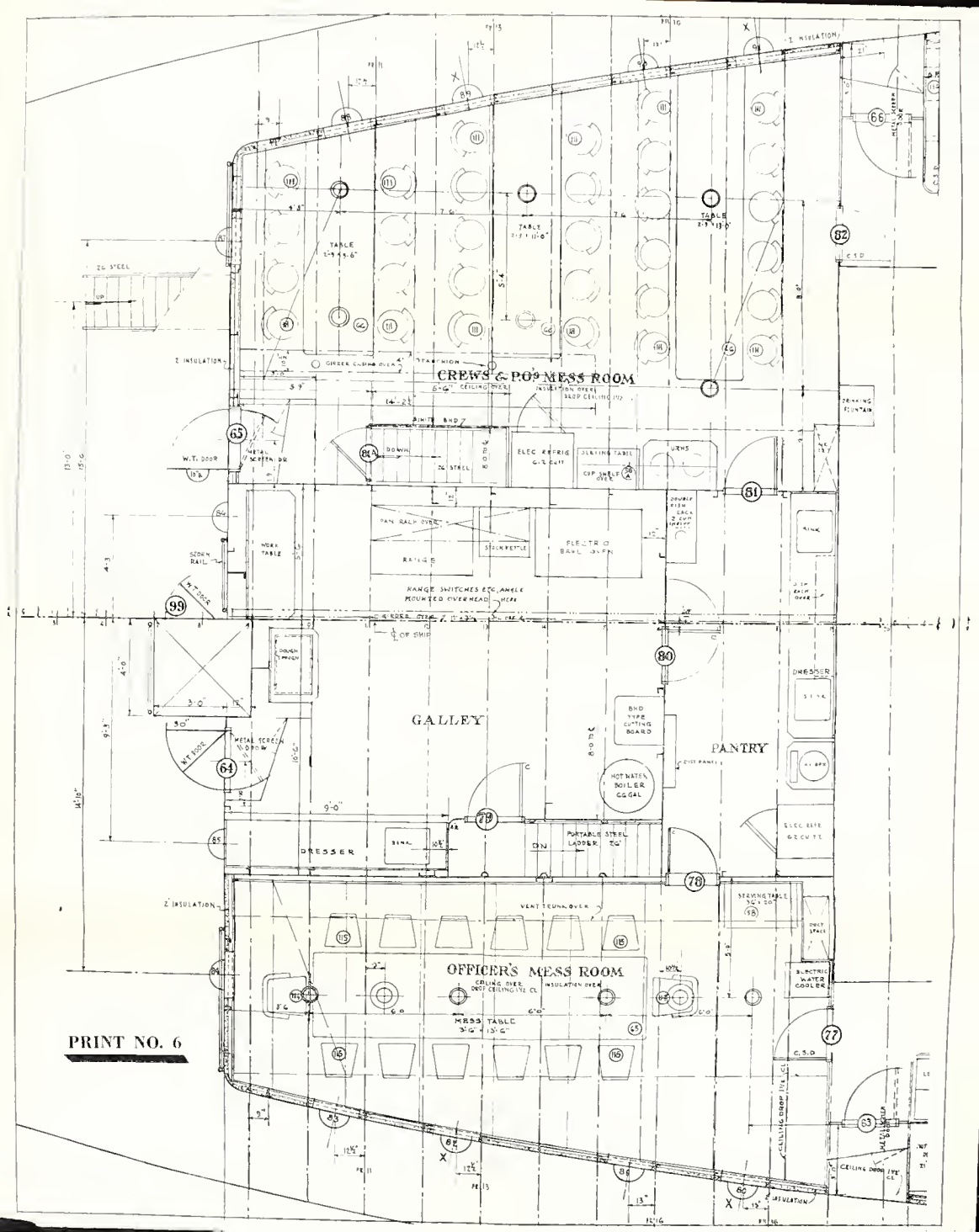
PRINT NO: 2


PRINT NO. 3
LOCKERS
LOCKERS
BATH
CEILING OVER
INSUL OVER
DROP CEILING 1½" CL
TUB
W.C.
W.B.
MIRROR
SETTEE
6'-0" LONG
NO DRAWERS UNDER
W.R.
R.T. DESK
30 x 48"
CHEST OF DRAWERS
21" x 30"
2 PIPE BERTHS
2'-1" x 6'-0"
HEAD
HOSPITAL
CEILING OVER
INSUL OVER
DROP CEILING 1½" CL
LINE OF HOUSE ABOVE
TABLE
24" x 24"
STEWARD
CEILING OVER
INSUL OVER
DROP CEILING 1½" CL
2ND OFFICER
CEILING OVER
INSUL OVER
DROP CEILING 1½" CL
SHOWER
BED
2'-10" x 6'-6"
NO DRAWERS UNDER
PASSAGE
CEILING OVER
NO INSUL
DROP CEILING 1½" CL
METAL SCREEN DOOR
WATER TIGHT STEEL DOOR
LADDER DOWN TO SPACE BELOW
LOCKERS
MEDICINE CABINET
BATH
NO CEILING
NO INSUL
3RD OFFICER
CEILING OVER
NO INSUL OVER
DROP CEILING 1½" CL
INSULATION
FROSTED GLASS
℄ OF SHIP
DOWN
UP


℄ OF SHIP
ENGINE CASING
E GIRDER OVER 12"X3⅜
VENT TRUNK
CO² CYLINDERS
VENT TRUNK
W.T. SHD
VENT
STORM RAIL
RECESS
PASSAGE
CEILING OVER INSULATION OVER 1/2 CL. DROP CEILING
2"SQ. STANCHION
2"SQ. STANCHION
E GIRDER OVER 12"X3½
BED 2-10 X 6-6
NO DRAWERS UNDER
HEAD
DROP CEILING 1½" CL.
LINEN LOCKR
CEILING OVER INSUL OVER
W.R.
CASING OVER
BED 3'-6" X 6'-6"
NO DRAWERS UNDER
C.S.D.
BOOK CASE
METAL SCD.
W.T. STRUCT'L STEEL DR.
2" INSULATION
FILE
FILE
DROP CEILING 1½" CL.
CHIEF ENGRS OFF.
CEILING OVER INSULATION OVER
4TH ASST ENGR
CEILING OVER INSUL OVER DROP CEILING 1½ CL.
CHIFFONIER MIRROR
CHIEF ENG. ST. RM.
CEILING OVER INSULATION OVER DROP CEILING 1½" CL.
F.T. DESK 2'6" X 4'-10"
CHEST OF DRAWERS 21"X30"
TABLE 36"X36"
BATH
CEILING OVER INSUL OVER DROP CEILING 1½" CL.
SHOWER
EXHAUSTER OVER
W.C.
W.B.
K.C.
W.R.
NO DRAWERS UNDER
SETTEE 6'-6" LONG
NO DRAWERS UNDER
SETTEE 6'-9" HOLD.
FROSTED GLASS
2" INSULATION
FR. 30
FR. 32
FR. 34
FR. 35
FR. 37
FR. 38
FR. 40
FR. 41
FR. 43

PRINT NO. 4


3 WIPERS & 1 SPARE
DROP CEILING 1½" CL. CEILING OVER. INSUL. PARTLY
7 FIREMEN & 1 SPARE
DROP CEILING 1½" CL. CEILING OVER. INSUL. PARTLY
4 OILERS
DROP CEILING 1½" CL. CEILING OVER. INSUL. PARTLY
PASSAGE
(DECK PAINTED)
NO CEILING OVER. NO INSUL. OVER.
2 PIPE BERTHS 2'-6" x 6'-6"
2 HANGING DRAWERS UNDER LOWER BERTH
NO DRAWERS UNDER
LOCKERS 16" x 24" 72" HIGH
LOCKER 16" x 24" 72" HIGH
W.B.
W.B. MIRROR
CHEST OF DRAWERS 2'-6" x 30"
BENCH
WALL DESK
VENT CASING
SETTEE 6'-2" LONG
2" INSULATION
2G STEEL.
15 FIXED LIGHT WITH HINGED D.L. IN FOOD FRONT BKD.
1-2" INSULATION
W.T. STRUCK STEEL DR. 2'-6" x 6'-0" CL. OPG.
SCREEN DOOR
ARCH
N.W.T. DR.
VENT. TRUNK
UP.
(SLOPING BKD.)
2G STEEL
DRINKING FOUNTAIN RECESS
138'-9" RADIUS.
FR 31
FR 32
FR 34
FR 36
FR 38
FR 39
FR 40
FR 41
FR 42
FR 43
FR 45
PRINT NO. 5


CREWS & POS MESS ROOM
GALLEY
PANTRY
OFFICER'S MESS ROOM
DRESSER
MESS TABLE
PRINT NO. 6

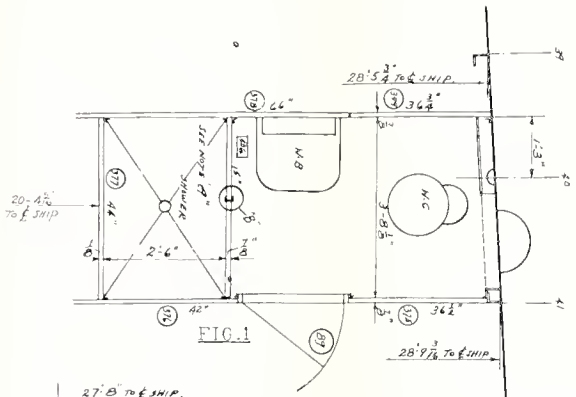


FIG. 1

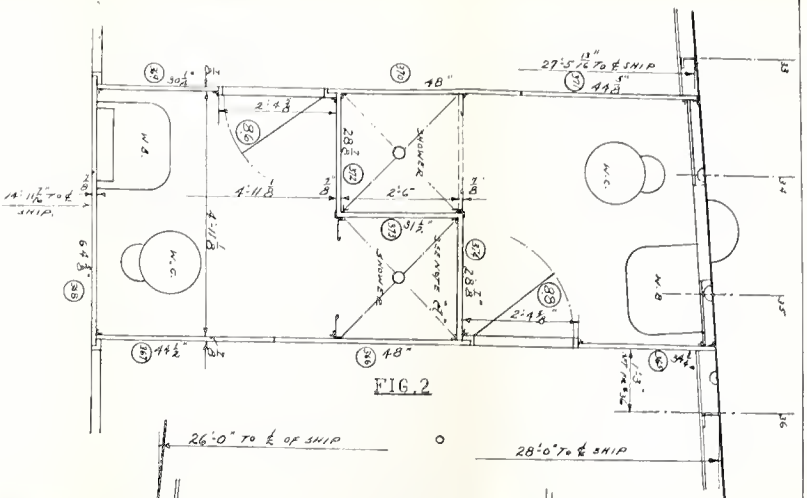


FIG. 2

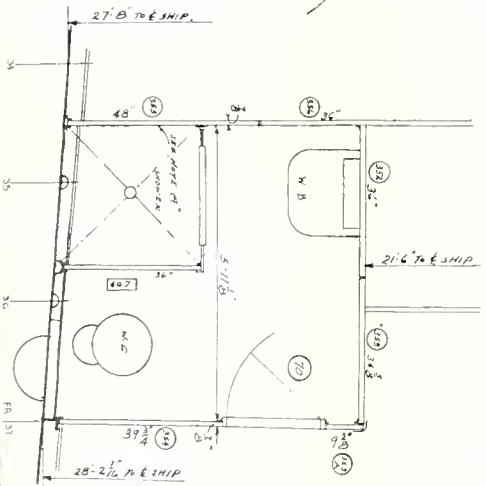


FIG. 3

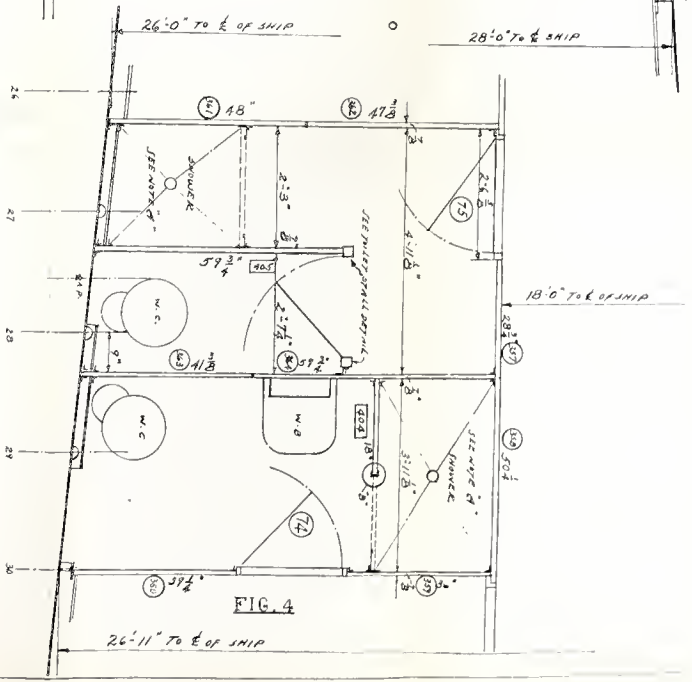
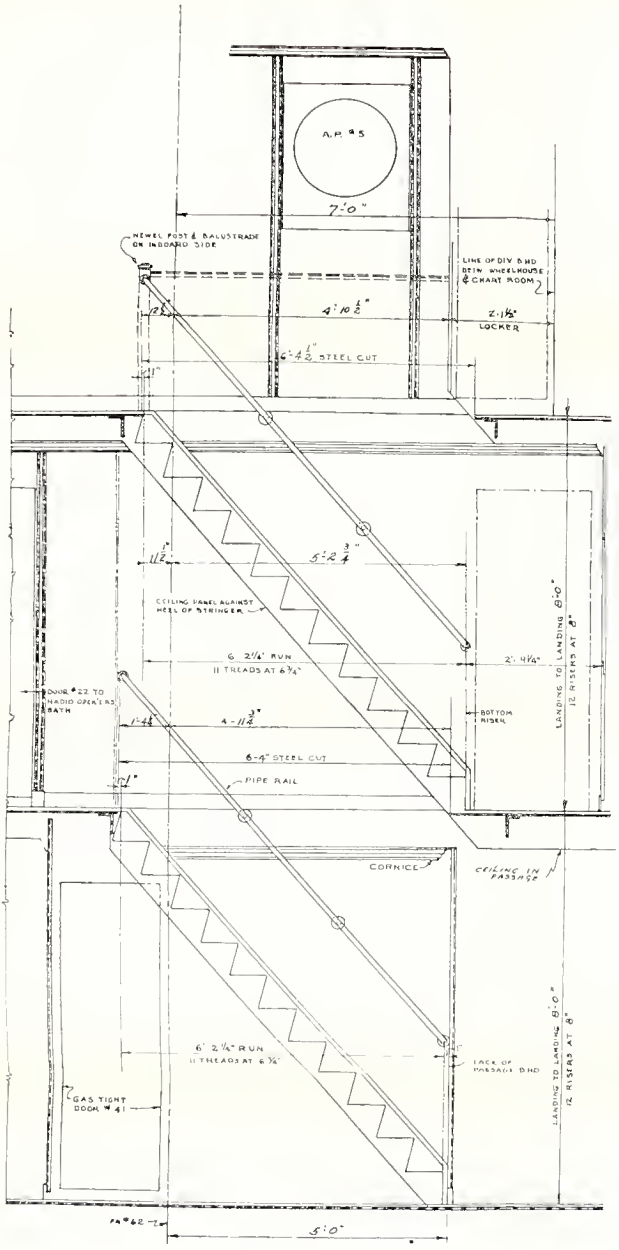
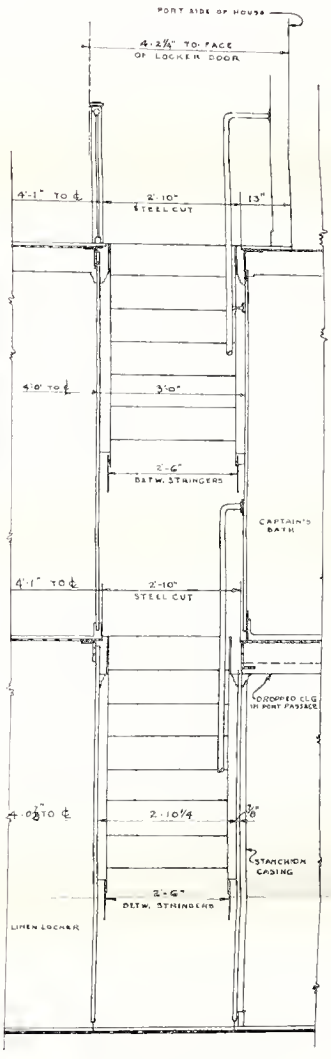


FIG. 4

PRINT NO. 7



VERTICAL SECTION THROUGH STAIRS
LOOKING OUTBOARD



VERTICAL SECTION AT FRAME # 62
LOOKING AFT.

PRINT NO. 8